THE SHIPPING PROBLEM. *See p.* 576.
ELIMINATING RIVETED JOINTS IN LIGHT STEEL BOATS. *See p.* 581.

SHIPBUILDING AND SHIPPING RECORD. *December* 30, 1915.
REGISTERED AT THE G.P.O. AS A NEWSPAPER.

SHIPBUILDING AND SHIPPING RECORD

A JOURNAL OF SHIPBUILDING, MARINE ENGINEERING, DOCKS, HARBOURS AND SHIPPING

LONDON: Queen Anne's Chambers, S.W.
GLASGOW: 87, Union Street.
NEWCASTLE: Lloyds Bank Chambers.

THURSDAY, DECEMBER 30, 1915.

Price Sixpence Weekly.
Prepaid Subscription for 12 months:—
Inland, £1 5s. 0d.; Abroad, £1 12s. 0d.

FOR MARINE ENGINEERING AND SHIPBUILDING WORK.
Forgings, Stampings, Castings, Rods, Sheets, Wire, Tubes, etc.
DELTA METAL
Bronze, Yellow Metal, Copper, Brass, White Metals, etc.
THE DELTA METAL CO., LTD.,
DELTA WORKS,
EAST GREENWICH, LONDON, S.E.

THE YORKSHIRE COPPER WORKS, LTD., LEEDS.
TUBES BRASS and COPPER.
"BEMAL" BRASS CONDENSER TUBES.

THE "STONE-LLOYD" SYSTEM of HYDRAULICALLY OPERATED WATERTIGHT DOORS.
AS FITTED TO LATEST MAIL AND PASSENGER STEAMERS.
J. Stone & Co., Ltd.
Deptford, LONDON, S.E.

ROBT. BOWRAN & Co., LTD., Newcastle-upon-Tyne.
MARINE METALS
"WHITE" BRONZE, "MARINE" BRONZE.

SEE'S ASH EJECTORS,
SELF-TIPPING ASH BUCKETS, &c.
PATENT
ASH DISCHARGING APPLIANCES
F. J. TREWENT & PROCTOR, LTD.
43, BILLITER BUILDINGS, LONDON, E.C.

WM. McGEOCH & CO. LTD.
FOR
Ships' Brassware, Lamps & Electric Fittings
GLASGOW, BIRMINGHAM, LONDON & NEWCASTLE.

JOHN I. THORNYCROFT & Co., Limited.
CAXTON HOUSE,
WESTMINSTER, S.W.
Telephone: VICTORIA 8,000.
SHIPBUILDERS & ENGINEERS.
PARAFFIN & PETROL MODELS
MOTOR LAUNCHES AND
ALL TYPES OF POWER CRAFT.

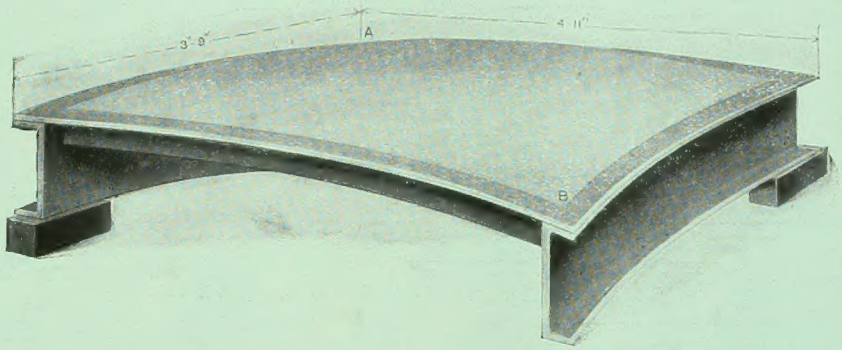
N. HINGLEY & SONS, LTD.
Netherton Iron Works
DUDLEY.

ELECTRICAL INSTALLATIONS ON STEAMSHIPS. - - - -
W. C. MARTIN & CO.,
10, West Campbell Street, Glasgow.
Telegrams: "MOTIVE," Glasgow.
Contractors for Cunard R.M.S. "AQUITANIA."

"SUN" TUGS
ALL CLASSES OF TOWAGE AND LIGHTERAGE.
LARGE LIGHTERS. POWERFUL PUMPS.
Apply to:—
W. H. J. ALEXANDER,
WAPPING, LONDON, E.
Telegrams: "SKIFFS, WAPP, LONDON."
Telephone Nos.: Avenue 921 (4 lines).
„ 2400 for Night and Sunday use.

Alphabetical Index of Advertisers Page 22
3 w.
Classified Index to Advertisements, Page 17.

DOCKERS' INDUROLEUM
FIREPROOF FLOORING *for*
SHIPS, SHIPS' SALOONS, &c., &c.



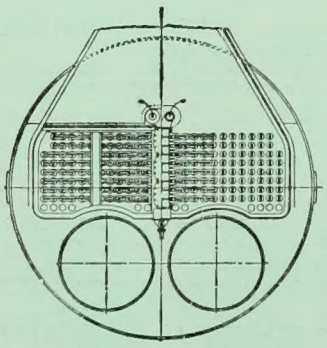
This Sketch shows an actual test of "INDUROLEUM" Flooring. The "Induroleum" was laid ¾ in. thick on ¼ in. Steel Plate and supported at cross corners, the opposite corners A B were then pressed down by hydraulic pressure to the extent of 3 in., and released without any sign whatever of cracking the "Induroleum."

INDUROLEUM is the finest flooring composition obtainable. It is FIREPROOF, ELASTIC, JOINTLESS, ANTISEPTIC. It is easily applied and sets with an even surface. *Supplied in all Colours.*

DOCKER BROTHERS, LTD., *Head Offices:* SALTLEY, BIRMINGHAM.

Telegrams: JAPAN, Birmingham. Telephone: 6410 Central (six lines).

Can be fitted to any boiler



The "Robinson" Superheater

was invented by a British Engineer, is owned by a British Company, and is manufactured entirely in Great Britain.

If you are a user of superheated steam let us demonstrate to you the advantages of the

"Robinson" Marine Superheater

the simplest and most reliable superheater on the market. It possesses special features which are not obtainable in other types. It NEVER leaks. It is the only superheater which has all parts readily accessible for cleaning and inspection. It economises coal and—it

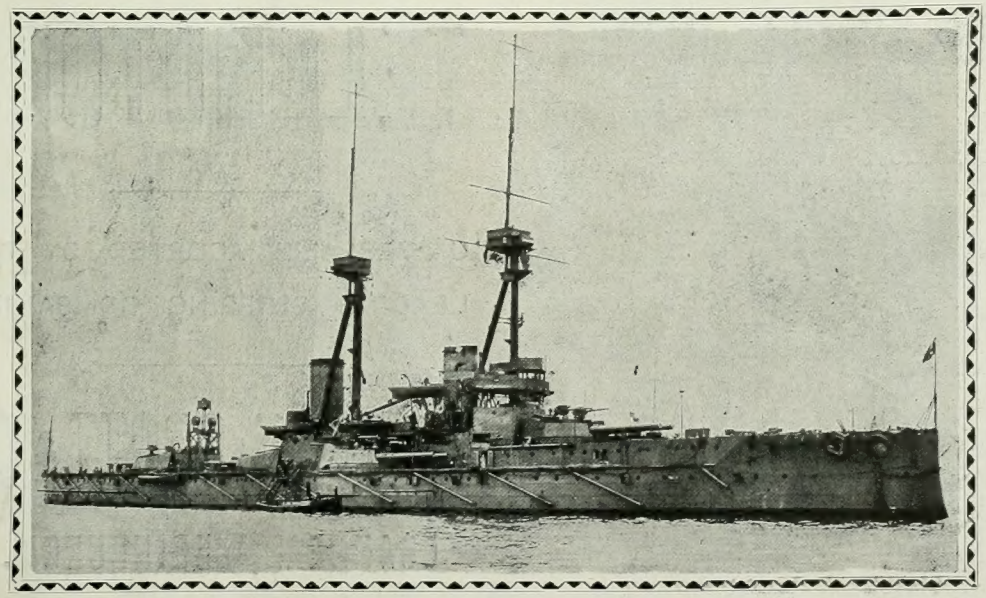
is British.

Write for our Booklet.

The SUPERHEATER CORPORATION, Ltd.
9 BRIDGE STREET, WESTMINSTER, S.W

GRAHAM'S
PATENT LOUD-SPEAKING NAVAL TELEPHONES
ADOPTED BY THE BRITISH ADMIRALTY, FOREIGN GOVERNMENTS
AND THE LEADING STEAMSHIP COMPANIES.

The Telephone Without Equal for Every Class of Naval Construction.



Graham's Instruments are Original Models Designed and Manufactured by Specialists.

ALFRED GRAHAM & COMPANY,
ST. ANDREW'S WORKS, CROFTON PARK,
LONDON, S.E.

TELEGRAMS:
"NAVALHADA, BROCK, LONDON."

TELEPHONE:
SYDENHAM, NO. 952.

SAY YOU SAW IT IN THE "S. & S. R."

CORROSION & PITTING & ATLAS "E."

It is generally agreed that corrosion in boilers is caused by acidity whether it be set up by electrolytic action or by imported impurities in the feed water.
Prevention of corrosion, therefore, can only be attained by direct neutralisation of acidity and antiseptic action on all impurities.
Atlas "E" is a mineral Preservative possessing a strong reducing action (and differs in this respect from all others) for by this means it preserves the whole structure of the boiler. Free oxygen, the cause of pitting, is taken into combination with the Preservative to form a stable, insoluble, inert product. To an extent alkaline, it combines with carbonic acid gas forming a soluble carbonate, which, in its turn, acts on other salts, preventing hard scale-forming salts. Grease is acted on, partly solidifies, amalgamates with and is precipitated with other solids. Thus

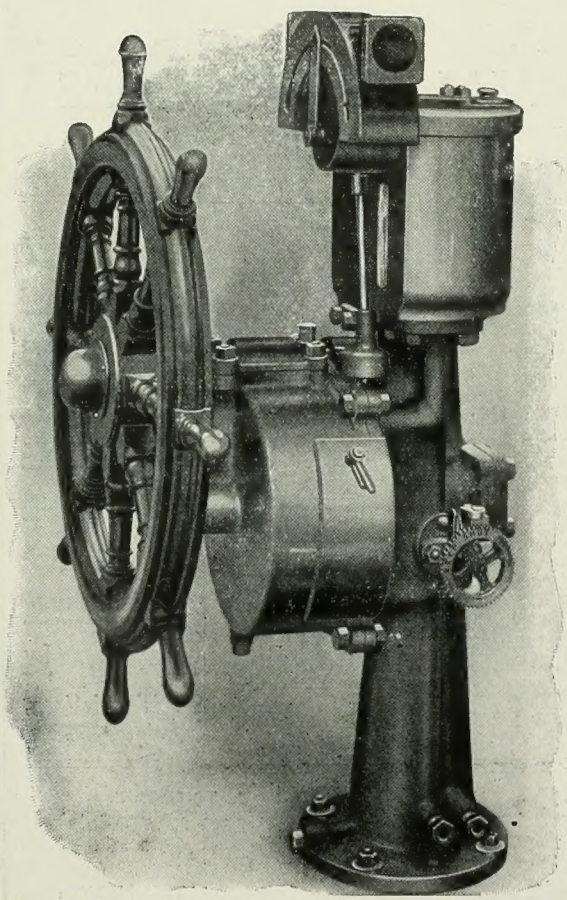
ATLAS "E" BOILER PRESERVATIVE

is a perfect safeguard against corrosion. Soda is not necessary in conjunction with the Preservative. Zinc plates, where used, can be reduced in number by 75%, and those remaining are preserved and rendered more durable.
Atlas "E" prolongs the life of all types of boilers, and is specially efficient in water tube designs.

PLEASE WRITE OR TELEPHONE US FOR FULL PARTICULARS.

ATLAS PRESERVATIVE CO., LTD., DEPTFORD, LONDON, S.E.

TELEPHONE NO.: 743 NEW CROSS.



STEERING TELEMOTORS

UNIVERSALLY ADOPTED BY THE LEADING SHIPPING COMPANIES.

MACTAGGART, SCOTT & Co., LTD.

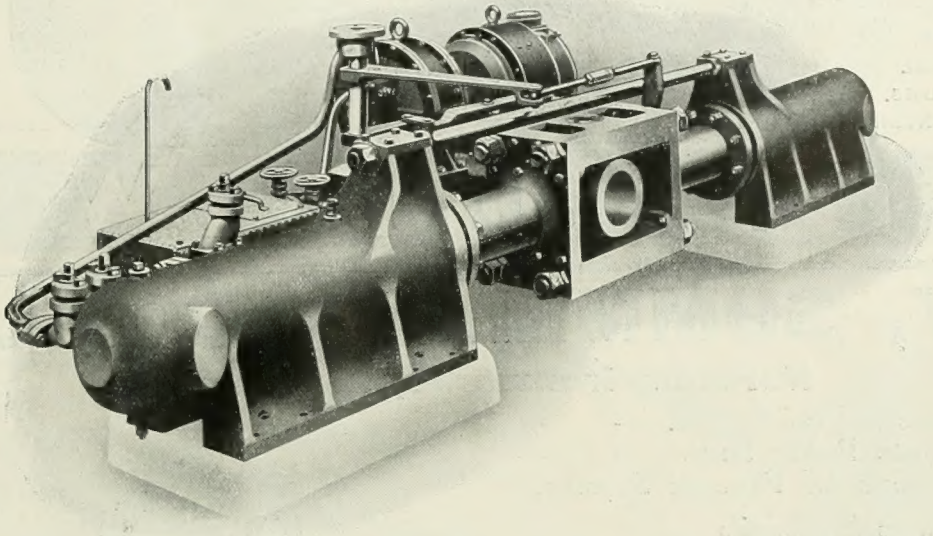
LOANHEAD, EDINBURGH.

Telegrams: "Valve, Loanhead." :: Telephone No. 12.

CONTRACTORS TO BRITISH AND FOREIGN ADMIRALTIES.

HELE SHAW MARTINEAU ELECTRIC - HYDRAULIC

STEERING GEAR.



JOHN HASTIE & CO., LTD.,
ENGINEERS ∴ GREENOCK.

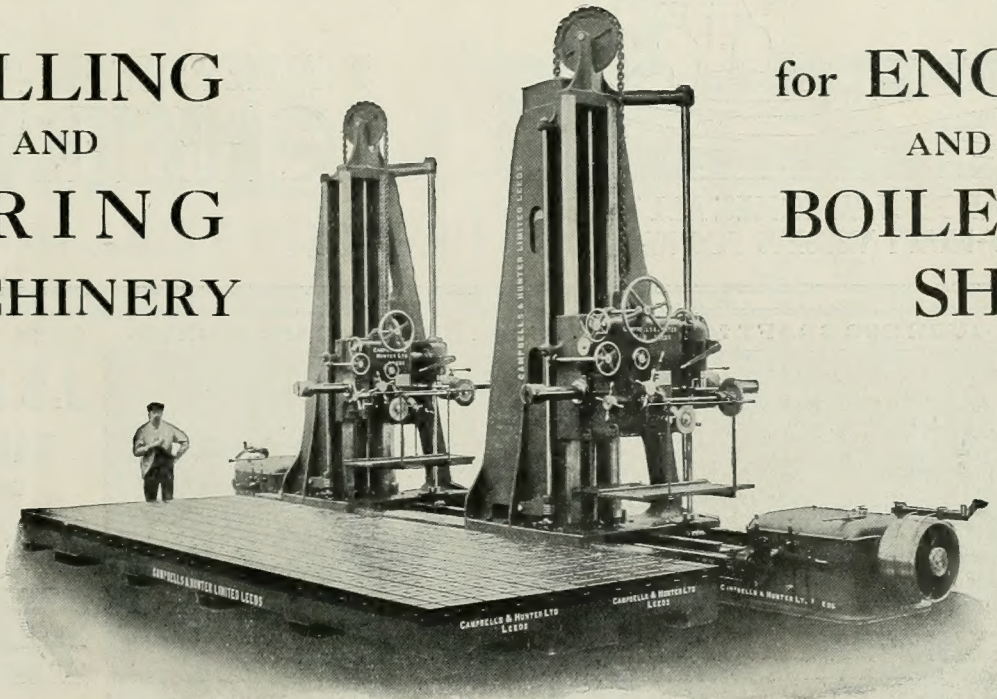
CAMPBELLS & HUNTER, Limited,

TELEGRAMS: DOLPHIN, LEEDS.
TELEPHONE: 768 LEEDS.

Dolphin Foundry, LEEDS.

DRILLING AND BORING MACHINERY for ENGINE AND BOILER SHOPS.

Of all Types and up to the Largest Sizes.



Your enquiries will be esteemed.

HORIZONTAL DRILLING, TAPPING, STUDDING, BORING, FACING & MILLING MACHINE.

J. SAMUEL WHITE & Co LTD

WHITE-FORSTER WATER TUBE BOILERS.
WHITE-FORSTER FEED REGULATORS.
OIL FUEL PUMPS AND BURNERS.
MARINE OIL-FUEL INSTALLATIONS.
RECIPROCATING ENGINES.

80ft STEEL TWIN SCREW, SHALLOW DRAUGHT, MOTOR MAIL VESSEL, "MANATEE" FOR SERVICE IN SOUTHERN NIGERIA.

MARINE-DIESEL OIL ENGINES

BUILDERS OF TORPEDO CRAFT.
SPECIAL SERVICE VESSELS.
STEAM & MOTOR LAUNCHES

LONDON OFFICE.
28, VICTORIA St SW
TEGRMS "CARNAGE LONDON"
TELPHN 4507 VICTORIA.

EAST COWES, I.W.

HEAD OFFICE.
TEGRMS "WHITE EAST COWES."
TELPHN No 3 COWES

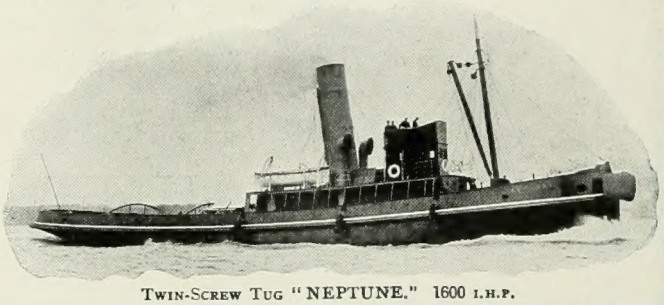
DAY, SUMMERS & CO., LTD.,

Northam Ironworks, Southampton.

Engineers and Shipbuilders. - -
Tug Boats, Paddle Boats. - -
Cargo Boats and Passenger Steamers.

2 Slipways for Repairs
and 2 Sets Steam Sheers.

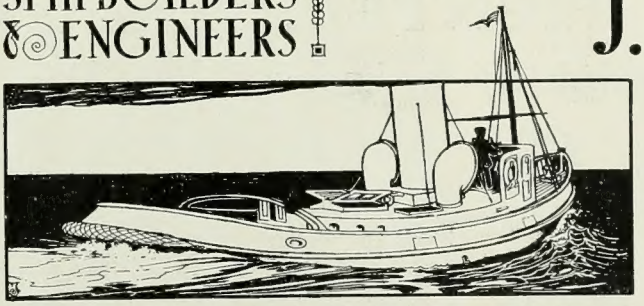
SPECIALITIES—
Land and Floating Traversing Sheers. Patent Hauling-up Slipway Machinery. Steam Ferry Bridges.



TWIN-SCREW TUG "NEPTUNE." 1600 I.H.P.

SHIPBUILDERS & ENGINEERS

J. CRICHTON & CO., LTD.

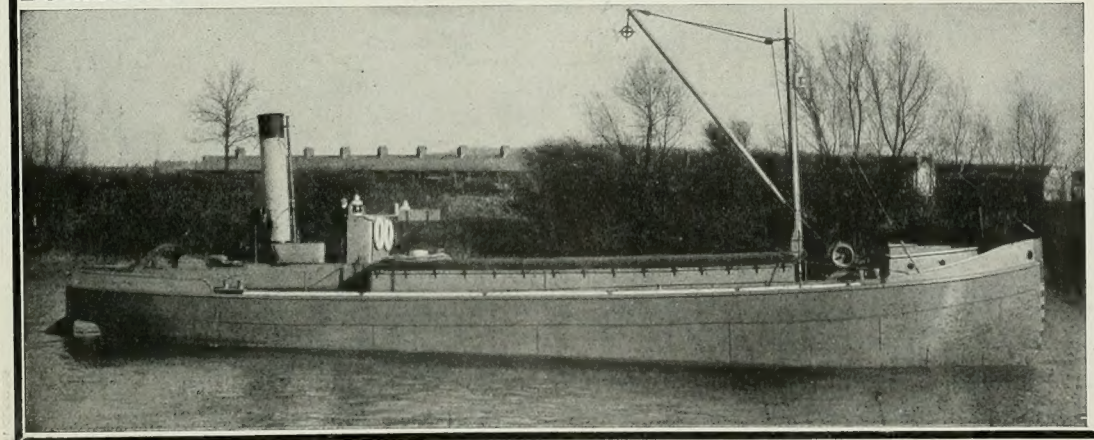


SALTNEY SHIPYARD, CHESTER.

TUGS, BARGES, LAUNCHES. ALL TYPES OF SHALLOW-DRAFT VESSELS FOR RE-ERECTION. HEAD OFFICE, TOWER BUILDING, LIVERPOOL.

BUILDER of OVER 900 CRAFT for the PORTS and RIVERS of the WORLD.

Estd. 1869. Tel.: 65 Gainsboro.

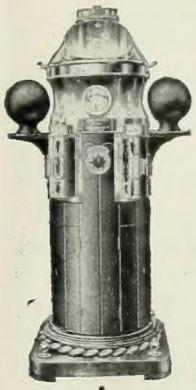


J. S. WATSON,
GAINSBORO',

Builder of

STEEL LIGHTERS,
TUGS,
MOTOR BARGES,
STEAM BARGES,
HOPPER BARGES.

Speciality:
WORK FOR SHIPMENT ABROAD.



Kelvin, Bottomley & Baird, Ltd.,
Formerly Kelvin & James White, Ltd.,
16-20, Cambridge Street :: :: :: :: Glasgow.

Sole Makers of the Genuine
LORD KELVIN COMPASS.

Specify

Kelvite Standard Compass.
Kelvite Steering Compass.
Kelvite Vertical Card Compass.
Kelvite Motor Sounding Machine.
Kelvite Mark IV. Sounding Machine.
Kelvite Merchant Pattern Sounding Machine.

NOTE NEW TRADE MARK

"**KELVITE**" means,
manufactured by the firm of
Kelvin, Bottomley & Baird, Ltd.

TAPS
for
BRITISH SHELLS

Having standardized various patterns for this work, we are in a position to offer prompt deliveries of taps for

3·3, 4·5, & 6 in. H.E. SHELLS,
No. 1 GAINE,
No. 100 GRAZE FUZE.

THOS. CHATWIN, LTD.,
GREAT TINDAL ST., BIRMINGHAM.

RHYMNEY IRON CO., LTD.

ESTABLISHED 1836.

PROPRIETORS OF THE **"RHYMNEY MERTHYR"** SMOKELESS STEAM COAL

On ADMIRALTY List.

Used by the Principal Steamship Companies

"BRITHDIR"

Bituminous Bunkering Coal.

COKE MANUFACTURERS.

Shipping Ports—**Cardiff, Penarth, Barry and Newport.**

F. B. SAUNDERS, Commercial Manager, Merthyr House, Cardiff.

Telegrams: "RICO, CARDIFF." Telephone 2945 Cardiff.

LONDON OFFICE—26, Martin's Lane, Cannon Street, E.C.

LIVERPOOL Agency—8, India Buildings, Fenwick Street.

LISBON Agency—Messrs. James Rawes & Co.

D. DAVIS & SONS, LIMITED,

SHIPPERS OF

"COEDELY"

(Welsh Navigation Steam Coal Co., Ltd.)

No. 2 RHONDDA COAL
For Bunkering & Manufacturing.

No. 3 RHONDDA COAL
High-class Smiths' and Coking Coal.

BITUMINOUS COAL
Hard, and Free from Small.

STEAM COAL.

COKE AND BY-PRODUCTS.

"FERNDALE"

(D. DAVIS & SONS, LIMITED.)

FERNDALE COAL is produced from the 9 Pits of the **Ferndale Collieries,** which work one unbroken Mineral area of nearly seven square miles in the Rhondda Valleys, and are situated within that portion of the South Wales Coalfield whence the best Smokeless Steam Coals are worked.

FERNDALE COAL is noted for its **Uniform Quality, Great Evaporative Power, Purity, and Durability.**

FERNDALE COAL is used extensively by the British and other Admiralties, and is shipped to all the principal Coaling Depots. It is a favourite Coal with Steamship Companies, to whom Speed and Smokelessness are important.

"Griffin-Nantyglo"

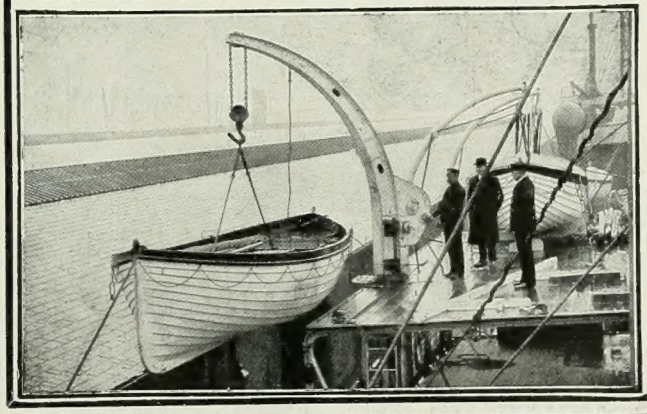
(John Lancaster & Co., Ltd.)

GRIFFIN-NANTYGLO STEAM COAL from the **Western Valleys of Monmouthshire** bears the highest reputation for **Locomotive & Bunkering Purposes.**

GRIFFIN - NANTYGLO WASHED COALS include: — **Nuts, Peas, Beans, and Duff,** and are celebrated for their **Uniform Purity.**

SHIPPING PORTS: Cardiff, Barry, Penarth, Newport & Port Talbot. CHIEF OFFICES: Cymric Buildings, Cardiff.
LONDON OFFICES: 138, Leadenhall Street, E.C. PARIS (Office of Concessionaire): 22, Rue St. Augustin. Telegrams: "Ferndale," Cardiff, London and Paris.

LIFE-SAVING AT SEA :: BOAT LAUNCHING REFORM.



Maximum of Speed and Safety in Boat Launching attained by fitting

GRAHAM'S PATENT SINGLE DAVIT

Approved by Board of Trade. *In use on Ocean Liners.*

Having Mechanical Slewing and Lowering Gear.
Single Suspension. : : : : Central Slinging.
Single Automatic Detaching Hook.

Saving in Weight, Space and Upkeep.

Full particulars from Proprietors:—

JAMES HOWDEN & CO., LTD., SCOTLAND ST., GLASGOW.

PACKING AND STEAM TRAPS

The Finest in the World. **Fitted on Britain's Largest Liner.**

R.M.S. "AQUITANIA."

THE UNITED STATES METALLIC PACKING CO., LTD., Soho Works, BRADFORD, YORKS.

LONDON: 116, Fenchurch St. LIVERPOOL: 15, Fenwick St. GLASGOW: 52, St. Enoch Sq.
NEWCASTLE: 2, Collingwood St. SWANSEA: Pembroke Bldgs. Belfast, Hull, Bristol, Cardiff, etc.

CAMBRIAN NAVIGATION SMOKELESS STEAM COAL.

(On British and Foreign Admiralty Lists.)

RECOGNISED AS THE BEST QUALITY
— OF CARDIFF STEAM COAL. —

PROPRIETORS:

CAMBRIAN COLLIERIES LTD.

Regd. Offices: CAMBRIAN BUILDINGS, CARDIFF.
London Offices: 31, GREAT ST. HELENS.

Telegraphic Addresses: "Cambrian, Cardiff." "Glamorgan, London."
Telephones: Cardiff 3280; London 4316 & 4317 Avenue.

SHIPPERS:

THOMAS & DAVEY, CAMBRIAN BLDGS., CARDIFF.

'HOOD'S MERTHYR' STEAM COAL

(On British and Foreign Admiralty Lists.)

FOUNDRY AND FURNACE COKE.

SULPHATE OF AMMONIA, TAR.
No. 2 & 3 RHONDDA LARGE, THRO & SMALL COALS.

PROPRIETORS:

GLAMORGAN COAL CO., LD.

Regd. Offices: CAMBRIAN BUILDINGS, CARDIFF.
London Offices: 31, GREAT ST. HELENS.

Telegraphic Addresses: "Glamorgan, Cardiff." "Glamorgan, London."
Telephones: Cardiff 3280; London 4316 & 4317 Avenue.

SHIPPING AGENTS:

LYSBERG, LTD., CAMBRIAN BLDGS., CARDIFF.

NAVAL MERTHYR SMOKELESS STEAM COAL.

(On British and Foreign Admiralty Lists.)

PROPRIETORS:

NAVAL COLLIERY CO. (1897) LD.

Regd. Offices: CAMBRIAN BUILDINGS, CARDIFF.
London Agency: 21, ST. MARY AXE.

Telegraphic Address: "Naval, Cardiff."
National Telephone: 3280. London 3304 City.

SHIPPING AGENTS:

L. GUERET, LTD., CAMBRIAN BLDGS., CARDIFF.

BRITANNIC MERTHYR STEAM COAL.

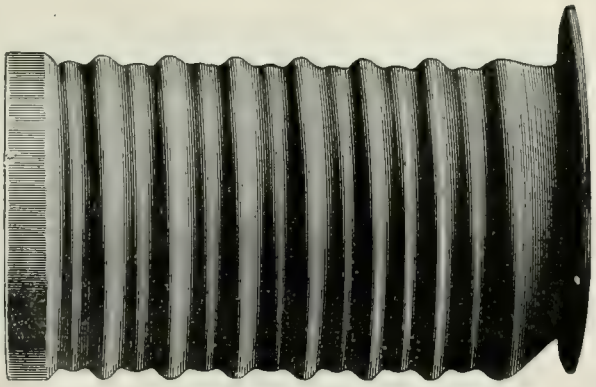
PROPRIETORS:

BRITANNIC MERTHYR COAL CO., LTD.

Regd. Offices: CAMBRIAN BUILDINGS, CARDIFF.
Telephone: Cardiff 3280. Telegrams: "Britannic, Cardiff."

SHIPPING AGENTS:

THOMAS & DAVEY, CAMBRIAN BLDGS., CARDIFF.



DEIGHTON'S PATENT FLUE & TUBE Co., Ltd.

Telegrams: "Flues, Leeds." Telephone: 1674 (National).

MAKERS of DEIGHTON, MORISON and FOX TYPE of

CORRUGATED FURNACES

For MARINE and LAND BOILERS.

FULL PARTICULARS AND CATALOGUE ON APPLICATION.

No other Type of Furnace has a Greater Heating Surface per foot run than the DEIGHTON Section.

VULCAN WORKS, PEPPER ROAD, HUNSLET, LEEDS.

By Royal Warrant

To His Majesty King George V.

WAYGOOD-OTIS LIFTS

have been fitted on

White Star Liner ...	...	BRITANNIC	(11)
White Star Liner ...	...	OLYMPIC	(8)
Cunard Liner ...	...	MAURETANIA	(14)
Etc.,	Etc.,	Etc.	

Falmouth Rd., S.E.

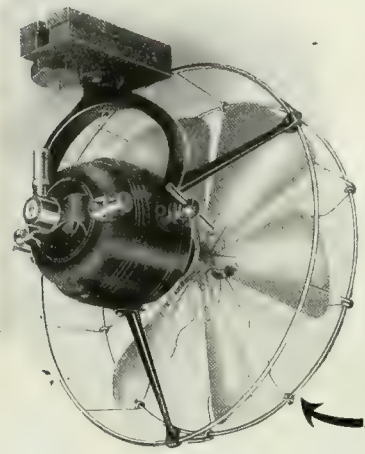
ELECTRIC FANS

EMI

of all types for Ship use.

Superintendents are invited to inspect our electrically driven

PUNKAHS.



Catalogue and Quotations on application from—

HOGAN & WARDROP

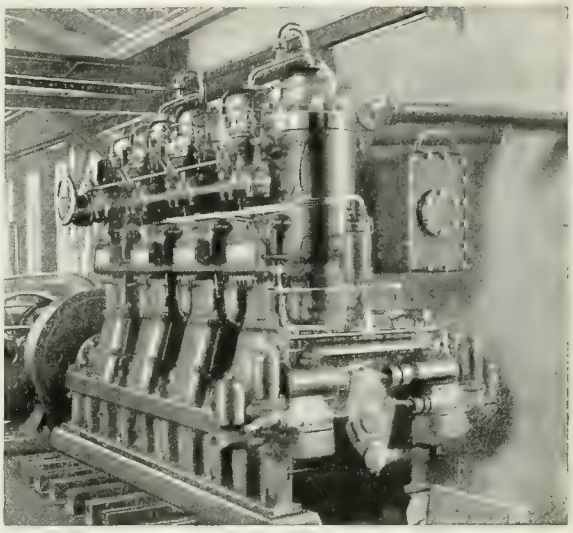
2, Gresham Bldgs., Basinghall Street, London, E.C.

Illustration shows Cabin Type, movable Fan with sole plate.

"SKANDIA"

MARINE OIL ENGINES

5 to 500 H.P.



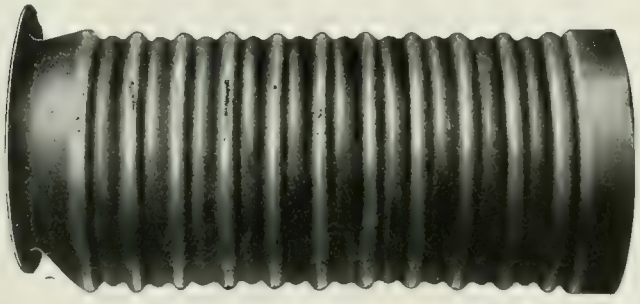
200 B.H.P. "SKANDIA" Marine Engine.
4 Cylinder Direct Reversible.
Uses Crude Oil with Hot Bulb Ignition.
No water injection. Water-cooled Cylinder Head.

Prices and full particulars from

WALTER D. FAIR & CO.,
43, Leicester Square, LONDON, W.C.
Agents for Australasia: Nelson & Robertson, 11-15, Loftus St., SYDNEY.

—FURNACES—

MORISON SUSPENSION, FOX CORRUGATED, DEIGHTON SECTION, OR PLAIN.



INTERCHANGEABLE AND WITHDRAWABLE TYPES.
BACK ENDS FLANGED TO ANY DESIGN.
MADE UNDER ALL SURVEYS.

THOMAS PIGGOTT & CO., Ltd.,

Telegrams: "ATLAS, BIRMINGHAM."

BIRMINGHAM.

SWAINS' BLOCKS

— GIVE BRILLIANT RESULTS AND —
ALWAYS LEAVE A GOOD IMPRESSION.

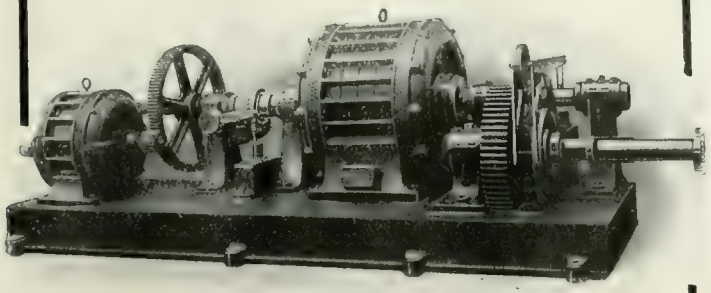
Engineers' requirements in the matter of illustration are thoroughly understood by us, and we shall welcome your enquiries

JOHN SWAIN & SON, LTD.,
Columbia House, 89-90, Shoe Lane, E.C.

WORKS: High Barnet.

BRANCHES:
Glasgow, Manchester and Paris.

SPECIALISTS in ELECTRIC POWER TRANSMISSION.



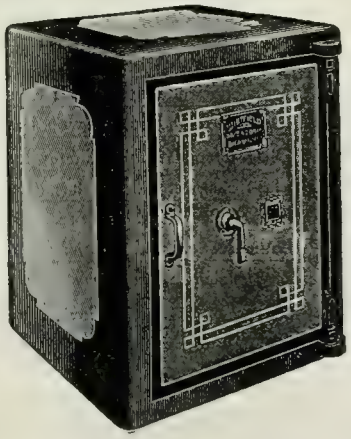
Slipway Haulage Gear,
Winches, Cranes, Punches,
Shears, Air Compressors,
Pumps, Graving Docks Plant.

Manufacturers:

J. H. HOLMES & CO.,
NEWCASTLE-ON-TYNE.

WHITFIELD'S SAFES

ON ADMIRALTY AND WAR OFFICE LISTS.



SUITABLE FOR

SHIPS' OR PASSENGERS' USE.

OXFORD STREET, BIRMINGHAM.
GODLIMAN STREET, LONDON, E.C.

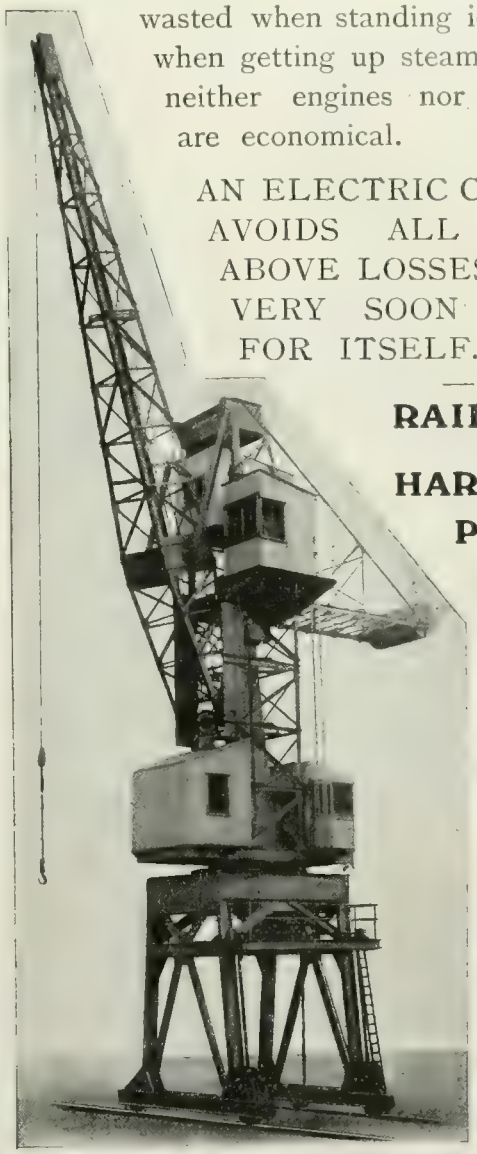
R. & Ltd. R.

Reliable Dock Cranes

Electricity as a motive power has proved immensely cheaper than steam for Dock and Harbour Cranes. Such cranes are seldom employed continuously throughout the day; fuel is thus wasted when standing idle and when getting up steam. Also neither engines nor boilers are economical.

AN ELECTRIC CRANE AVOIDS ALL THE ABOVE LOSSES AND VERY SOON PAYS FOR ITSELF.

RAILWAY AND HARBOUR PLANT



PATENT ELECTRIC LUFFING CRANE
as supplied to the
UNION OF SOUTH AFRICA.

SEAPLANE LAUNCHING APPARATUS

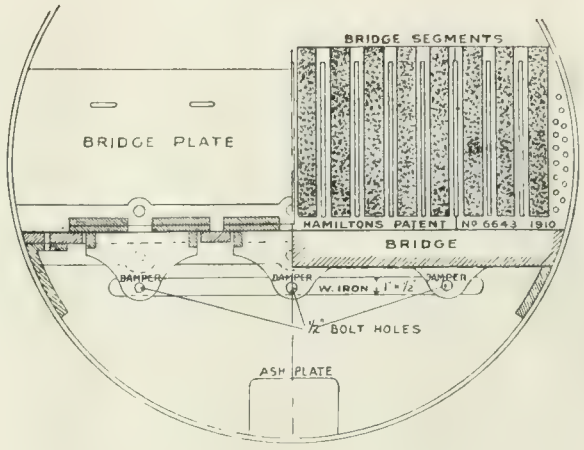
RANSOMES & RAPIER, LTD.

DEPARTMENT V.
32, VICTORIA STREET, WESTMINSTER, S.W.

HAMILTON'S
Patent Furnace Bridge
and
Patent "V" Grooved Firebars.

A. HAMILTON & SONS,
Iron and Brass Founders,
13, Bute Crescent, CARDIFF.

Makers of HAMILTON'S PATENT HAWSE PIPE and HAMILTON'S PATENT DECK FLANGE.



SHIPBUILDING AND SHIPPING RECORD
A JOURNAL OF SHIPBUILDING, MARINE ENGINEERING, DOCKS, HARBOURS AND SHIPPING

Special Number,
Wednesday,
Jan. 5,

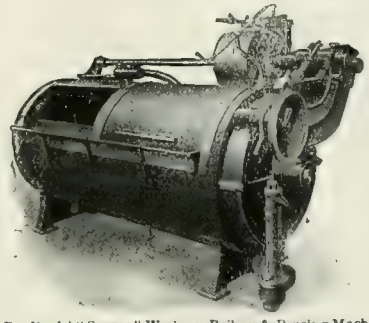
WILL CONTAIN

A Comprehensive Review of 1915.

ILLUSTRATIONS AND SPECIAL ARTICLES.

The ordinary weekly issue will appear on Thursday, Jan. 6th, as usual.

BRADFORDS'
LAUNDRY MACHINERY
FOR STEAMSHIPS



Bradfords' "Surgar" Washing, Boiling & Rinsing Machine.
— Saves Water, Soap, and Labour. —

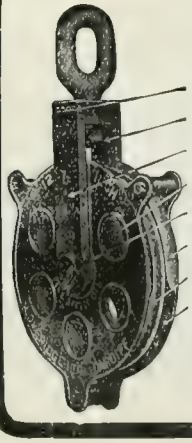
Laundries, ashore and afloat, a speciality.
Electric, Steam, or Hand-power.
Efficient and Economical.

Plans, Estimates, and Catalogue No. 319 post free on application

T. BRADFORD & Co.
MANCHESTER:
Crescent Iron Works, Salford.

LONDON:
141-142, High Holborn.

LIVERPOOL:
130, Bold Street.



ADOPT LOVERIDGE'S
And they will do you credit!

Tested to 100% overload, without extra.
Screwed rivetted collar, for security.
Superior forged straps, with boss for axle.
Oil reservoir feed, facilitates lubrication.
Flush compact axle, of large bearing.
Anti-chafing shoulders, preserve rope.
Lathe-deepened sheaves, support rope.
Best malleable iron cheeks, light and strong.

Loveridge's Blocks are heavier, stronger and better finished than most others, and cost little, if any, more. List on application.

LOVERIDGE, Ltd., Manufacturing Ship Furnishers, CARDIFF.

The Staffordshire Tube Co., Ltd.,
BIRMINGHAM.

ENTIRELY BRITISH MANUFACTURE.

ALL THE ADVANTAGES OF THE HOT BULB ENGINE BUT WITHOUT THE DISADVANTAGES.

KROMHOUT

BRITISH MARINE OIL ENGINES

PERMAN & CO. LTD.

82-83 Fenchurch Street

TELEGRAMS APERMACO LONDON

LONDON, E.C.

TELEPHONE 1944 AVENUE

LIVERPOOL AGENTS S.C.CHAMBERS & CO. 3 KING ST., LIVERPOOL

NO HOT BULBS.

NO WATER INJECTION.

HEAVY OIL.

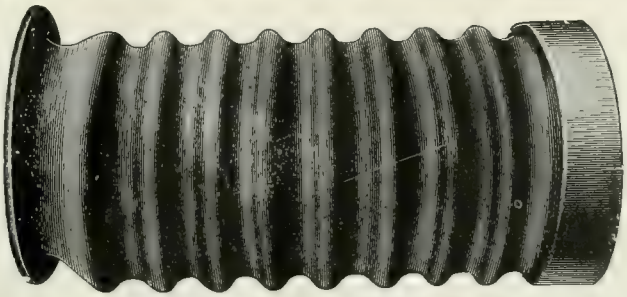
SUSPENSION BULB FURNACE.

UNIFORM SECTION.

(PATENT).

Board of Trade Constant for Suspension Bulb Furnace 15,000.

Strongest form of Furnace. Highest factor of safety.



Board of Trade Highest Constant for Other Corrugated Types 14,000.

Greatest diameter of Furnace ever officially tested to collapse.

Full particulars on application to—

THE LEEDS FORGE COMPANY, LTD., LEEDS.

London Office—CAXTON HOUSE, WESTMINSTER. MR. J. W. HAWLEY, Representative. Telegraphic Address—"ELEFFCO, LONDON."

BEST PURE WHITE

CLEANING, POLISHING & WIPING CLOTHS

ADMIRALTY ROPES.

Second-hand, in good condition. 2 to 4½ in., long useful lengths.

RUSSIAN TARRED HEMP ROPES.

Oakum and Tow Ropes. White Hemp Cords. Lashings. Clews and Lanyards.

JOHN PHILLIPS & SONS, Ltd.,

Telephone Nos.: London Wall 2966. Central 12396.

Contractors to the Admiralty, War Office and Allied Governments,

DINGLEY ROAD, CITY ROAD, LONDON, E.C.

Telegrams: "OUTBALANCE, LONDON."

REFRIGERATING MACHINERY

NH^3 and CO^2 Systems.

Insulation of Every Description.

THE LIVERPOOL REFRIGERATION CO., LTD.,

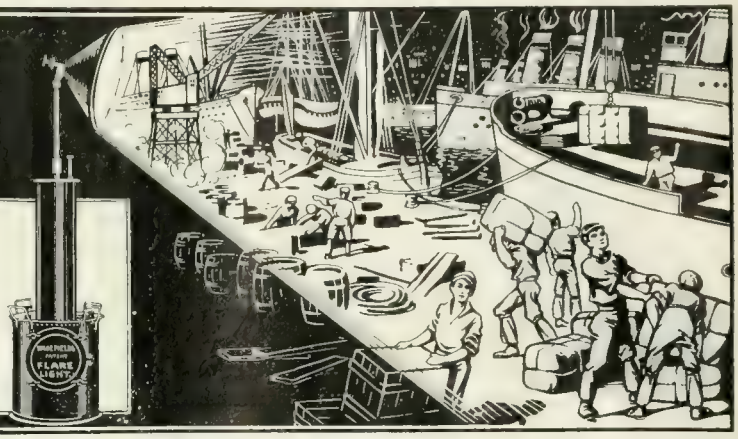
Colonial House, LIVERPOOL; London House, New London Street, E.C.

WAKEFIELD'S PATENT FLARE LIGHTS

AS SUPPLIED TO THE
ADMIRALTY AND MANY IMPORTANT
STEAMSHIP AND DOCK COMPANIES.

100 TO 5,000 C.P.
SIMPLE TO OPERATE.
CERTAIN IN ACTION.

CARBIC, LD. 51, HOLBORN VIADUCT, LONDON, E.C.

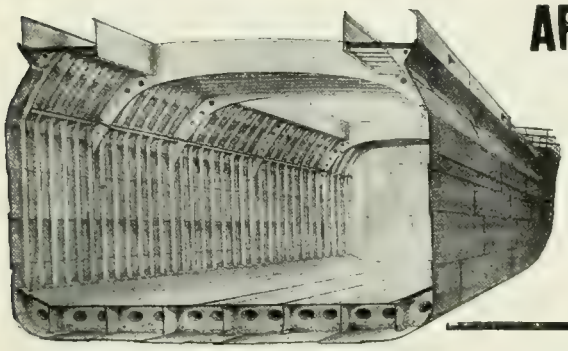


VESSELS OF A TOTAL DISPLACEMENT OF 57,133 TONS

built or building on the

ARCH PRINCIPLE OF SHIP CONSTRUCTION

(AYRE-BALLARD PATENT).



The advantages include
REDUCTION IN FIRST COST and
INCREASED CARRYING CAPACITY.

For particulars apply to the proprietors and licensors:
SWAN, HUNTER, & WIGHAM RICHARDSON, Ltd.,
and MAXWELL BALLARD, **WALLSEND-ON-TYNE.**

"ISHERWOOD SYSTEM OF SHIP CONSTRUCTION"

Suitable for ALL TYPES of Vessels.

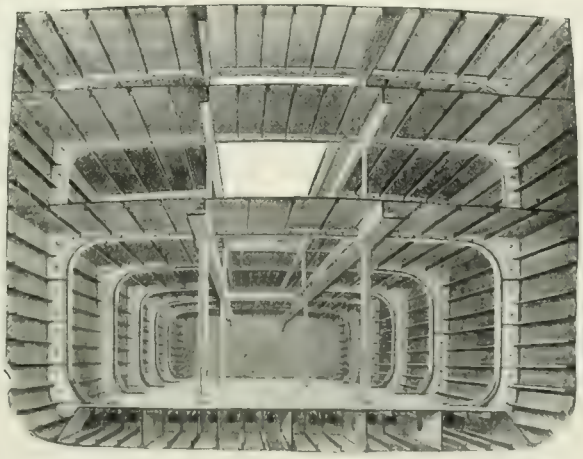
Increased Strength.

Increased Capacity for Bale Goods.

Increased D.W. Carrying Capacity.

Improved Ventilation.

Reduced Cost of Maintenance.



Reduced Vibration.

404 Vessels Built or being Built, representing about 1,988,000 gross reg. tons.

184 Bulk Oil Carriers, representing about 994,800 gross reg. tons.

For particulars apply to—

Telephone—
1064 Avenue.

J. W. ISHERWOOD,

4, LLOYD'S AVENUE, LONDON, E.C.

or to **S. C. CHAMBERS & CO., 3, King Street, LIVERPOOL.**

Telegraphic Address—
"Ishercon."

SHIPBUILDING AND SHIPPING RECORD
A JOURNAL OF SHIPBUILDING, MARINE ENGINEERING, DOCKS, HARBOURS AND SHIPPING

PUBLISHED EVERY THURSDAY AT
QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON, S.W.

Branch Offices—
GLASGOW: 87, UNION STREET. NEWCASTLE: LLOYD'S BANK CHAMBERS.
NEW YORK: WOOLWORTH BUILDING.

Telegraphic Address: "RECORDSHIP, LONDON." Telephone No.: 2247 VICTORIA.

Subscription, including regular weekly and special issues, published from time to time, payable in advance and postage free:—

British Isles..... £1 5s. 0d.
Elsewhere..... £1 12s. 0d.
Single Copies..... Sixpence.

The Editors will be glad to consider articles and paragraphs submitted by competent writers. All accepted contributions will be paid for. Whilst every care will be taken to return unsuitable articles, photographs and drawings (when a stamped addressed envelope is enclosed for that purpose) the Editors cannot hold themselves responsible for the safekeeping of unsolicited contributions.

VOL. VI. THURSDAY, DECEMBER 30, 1915. No. 27.

CONTENTS.

EDITORIALS:
Our Annual Review..... 573
Baltic Charters..... 573
The *Yasaka Maru*..... 573
War Risk Figures..... 573
Russian Transport Facilities..... 574
Pacific Ocean Trade..... 574
Spoiling the Munitions Act..... 574
Australian State Shipbuilding..... 574
Shipbuilders and Tanks..... 574
Alteration of Pitch..... 575
Propeller Mysteries..... 575
The Design of the Crank Shaft..... 575
A Feature of Oil Fuel Burning..... 575
Critical Speed of Rotors..... 575
The Government and Shipping Problems..... 576
Lubricating Marine Engines..... 577

ILLUSTRATED:
A New Method of Bending Plates for Eliminating Riveted Joints in Light Steel-Boat Construction..... 583

MISCELLANEOUS:
U.S. Shipbuilding..... 578
Alternative Types of Propelling Machinery for a 19½-knot Steamer 578
The Utility of the William Froude Tank..... 579
Able Seamen on Foreign Vessels... 582
Vessels Using the Panama Canal 584

GENERAL NEWS SECTION..... 585

OFFICIAL NOTICES AND SHIP SALES..... 591

SHIPPING SHARE MARKET..... 592

Our Annual Review.

THE *Shipbuilding and Shipping Record* Annual Review will be published on Wednesday next, January 5. This number is over and above the ordinary issues, the customary weekly number appearing as usual on Thursday, January 6. The year now closing has been one of many happenings and transcends in importance even the previous 12 months, for whereas our review of 1914 dealt with the effect of the outbreak of war on shipping and shipbuilding and the efforts made to deal with the emergency, the story of 1915 is one of the resourcefulness of these and allied industries in coping with the economic upheaval and the maintenance of such of our commerce as is necessary to supply our forces on land and sea and to stabilise our credit with other nations. In addition to articles dealing with such subjects as the freight markets, export coal shipments, the price of second-hand tonnage and the fluctuations of shipping and shipbuilding securities, we will publish a series of charts and curves showing graphically the extraordinary upheaval in the commercial world. The illustrations will have added interest this year as reflecting at least some progress in mercantile work and the customary tabular compilations, including returns from foreign shipbuilding centres will appear as in previous issues. There will be a specially written contribution dealing with the changes necessitated by the Bulkheads Committee Reports and outline drawings will be published showing how the proposals affect existing types.

Baltic Charters.

In a case in which a chartered vessel has been detained in a friendly port in the Baltic owing to the dangers of war, the courts have held that the hire was still payable to the shipowners. Of course, such decisions depend entirely on the terms on which the contracts embodied in the charter party are framed. Unless the charterer has expressly divested himself in the charter party of liability in such circumstances he must fulfil his bargain, even although the delay in the voyage proves onerous. It is impossible, as one of the judges has remarked to apply the doctrine of frustration to a case where one of the parties is fulfilling his part of the contract within its terms. That, in fact, is what the owner of the vessel in question is doing. The charterer has the use of the ship for a voyage which is not yet completed. The delay is a grievous matter, but to transfer the whole financial loss to the shoulders of the shipowner would scarcely be an approach to justice.

The "Yasaka Maru."

The sinking of the N.Y.K. steamer *Yasaka Maru*, by an enemy submarine has affected the insurance market to a greater degree than the loss of other big liners, such as the *Lusitania* and *Hesperian*, &c. These vessels and others sunk under similar conditions, did not bring a great loss to the market as regards the hull, while their cargoes were either uninsured to a great extent, or consisted of such replacable interests as bonds, &c. The *Yasaka Maru* admittedly, carried a large and valuable cargo, and large lines had been placed with London underwriters, the premium being adequate to the risks to which she was exposed on a Mediterranean trip. It has been stated in the daily Press that the loss of the hull will also fall on the open market, but this is not so. The Japanese Government accept the war risk up to 80 per cent. of the value on Japanese steamers, on a system founded on our own War Risks Insurance Office. The balance of the value was placed with a Japanese insurance company and some portion of this company's line has reached the London market in the form of re-insurances, but the amount so placed is not a large one. The age, tonnage, and details of the lost vessel have been frequently stated in the daily newspapers, but it is interesting to note that she was insured against marine risks on a value of £270,000, while the insurances placed on her cargo have been estimated at £750,000.

War Risk Figures.

Mr. John Burns's question in the House of Commons as to the losses to British shipping by war and marine casualties seems pointless, as does also the attempt to restrain him from asking for the figures. The particulars have already been published as far as vessels entered in the Government War Risk Insurance scheme are concerned, while a Blue Book dealing with marine casualties is published annually. The figures published lose interest inasmuch as those who are interested have been able to obtain quite reliable information from other sources, and the fact that the results are much better than was anticipated is the only item worthy of remark. It appears that a loss of £10,000,000 was expected from the disasters of the first six months, but the actual amount turns out to be £2,732,000. In fact, the losses to the end of November, 1915, amount to less than the original estimate for the first six months, being £9,270,000. These figures, though satisfactory, are misleading as to the actual loss involved, the Government scheme only accepting vessels valued at cost, less 4 per cent. per annum. The large increase in steamers' values has made this amount quite inadequate, and the balance of the value has been covered elsewhere, generally with the War Risk Clubs or in the case of unhazardous voyages at Lloyd's or with the companies, at rates far below those asked under the Government scheme. With regard to the number of steamers lost, the average of 17 per month cannot be regarded as a large one, while the total of 272 does not amount to much, being

but 6·14 per cent. of the number entered with the War Risk Clubs, the percentage on the total of British shipping being, of course, far less.

Russian Transport Facilities.

Now that our great Russian Ally is again at grips with winter, and that her Baltic and Black Sea ports are still closed to overseas trade, the problem of communication with the outside world comes once more to the front. As far as can be ascertained, there is nothing to fear about Vladivostock, for, as was the case last season, this port will be kept open for shipments from North America. In addition, proposals are now being discussed for the establishment of sailings between Australia and Vladivostock, connecting at Hong Kong with the already existing services from this country to the Far East. Then, again, by means of more ice-breakers bought in Canada, it is hoped to maintain the navigable channel to Archangel free until, at all events, the end of January, quite a month and a half later than has ever been known before, and, as a matter of fact, sailings to and from New York, apart altogether from those with the United Kingdom, have already been arranged. In the event of the White Sea port becoming ice-blocked, it is expected that the new harbour at Ekaterina, in the Gulf of Kola, to which a railway from Petrograd is nearing completion, will be available. Every effort is, therefore, being made to maintain communication with Russia throughout the winter months, and, indeed, when the history of the war comes to be written, the work accomplished in this connection will certainly not be characterised as insignificant or unimportant.

Pacific Ocean Trade.

If, of late, the shipping trade of the Pacific has received much more attention than usual, developments, either in progress or contemplated, amply justify the prominence which it has been given. The obvious intention of the maritime interests concerned is to take advantage of a situation created by the enforced withdrawal of German tonnage, and the capture of German colonies, but in consequence of the wholesale requisitioning of steamers by the British and French Governments, most of the enterprise has so far been Dutch and Japanese. Unfortunately for the Americans, legislation has almost driven the Stars and Stripes from the trans-pacific routes, although, we understand, that a trade, chiefly in wool, copra, meat and lumber, is springing up between the United States and Australasia in American-owned ships. Holland, too, is taking her part in the struggle, and through the Java-Pacific Line, which is the creation of the Rotterdam Lloyd and Nederland companies, as well as the Java-China-Japan Line, has established sailings between Batavia and San Francisco, while it is considered likely that the itinerary will ultimately include Vancouver. But as might be expected, under the peculiar circumstances, it is the Japanese who are most to the fore. They are, in fact, exceedingly busy, and according to the latest information on the subject they wish to retain the Marshall and Caroline Islands. For many years, Australia has strained every nerve to maintain the supremacy of British trade with the Pacific Islands, and although serious mistakes have, admittedly, been made, it will be unfortunate if events defeat that object.

Spoiling the Munitions Act.

Years hence the student of history will, no doubt, regard it as curious that in the reorganisation of industry for the purpose of this war the conflicting elements were not Capital and Labour, but the State and Trade Unionism. In the Parliamentary discussions of the emergency legislation an occasional point has been made in the interests of employers. All of Mr. Holt's proposed amendments were, for instance, calculated to be of service to them. But none of the interventions has been organised, and practically all of them seemed to have been uninspired. As a class, shipbuilding and engineering employers have, in fact, completely submitted themselves to the State, and been given little or no credit by the State for their patriotism. The trade unions have, on the other hand, resisted the State's action in every way and on every possible occasion. The whole of the new proposals regarding the issue of certificates originated with them, and when they have the authority of Parliament the Munitions Acts will, to the extent of them, be less efficient than they ought to be. At first, Mr. Lloyd George was strongly disinclined to adopt Lord Balfour of Burleigh's recommendation that there should be no imprisonment for the non-payment of penalties imposed under the authority of the Act. Now, it appears, he has given way to the trade unions on the point, and the law is to be amended accordingly. Until the revised clause is available it is not, perhaps, wise to be definite, but if the alternative idea adopted turns out to be to deduct fines from wages employers generally will have good reason to complain. The least creditable to trade unionism of all its proposals are, however, those which seek to give what it regards as pre-war conditions of employment the effect of law. Many of the "conditions" which they are claiming were in dispute when the war broke out, and the interests of the workmen were quite adequately protected in the Second Schedule. Trade unionists do neither themselves nor their cause any good by ignoring these facts.

Australian State Shipbuilding.

The Public Accounts Committee of the Australian Commonwealth has collected a few significant facts at the Cockatoo Island naval dock which illustrate the difficulty of applying business methods to any State enterprise where organised labour is able to constitute itself the real master of the situation. The Committee learned that as a result of the day labour system, upon the maintenance of which the unions steadily insist, all classes of work are being turned out expensively in the yard. One witness stated that "the men on piece-work in English yards do two and two-thirds more than the men on Cockatoo Island." The manager of the yard (Mr. Julian King Salter, formerly of Chatham) gave the following particulars: "The cost of riveting steam drums and water pockets of a boiler is 40s. per 100 on piece-work in England, as against 70s. here. The cost of flanging boiler ends on piece-work in England is 1s. per ft.; here, on day labour, the cost is 6s. per ft. The cost of tubing boilers of 2,400 tubes by piece-work in England is £20; here the same amount of work on the day labour system costs £50." He gave other examples of the same kind, and remarked, "a certain quantity of work can be done in 1 hour in England on piece-work, whereas it takes 3 hours out here on day work." Mr. Salter is apparently as helpless as the Commonwealth Defence Minister in the matter. A large portion of his time is spent in studying the pitfalls of wages "logs," and preventing trouble between the unions. "Here am I," he told the investigating committee, "working under 51 awards—and new ones are cropping up every day!"

Shipbuilders and Tanks.

Since Mr. Baker, of the National Physical Laboratory, read a paper on the subject of his work at Teddington to the members of the North-East Coast Institution of Engineers and Shipbuilders a good deal has been heard in the district regarding the necessity of adding an experimental tank to the equipment of Armstrong College. Curiously enough, this is a subject which periodically crops up in one or other of the United Kingdom's shipbuilding or shipping centres. Not very long ago the people of Merseyside were agitated in their minds about the lack of a tank by the University of Liverpool. At Glasgow University there is no tank, although Sir John Biles and others have repeatedly pointed out that the world's greatest shipbuilding centre and the United Kingdom's oldest Chair of Naval Architecture are oddly incomplete without one. Two of Great Britain's five important tanks are, it is true,

on the Clyde, but both are the private property of firms, and are not available to shipbuilders generally as is that at the National Physical Laboratory. Nobody who is intimate with the industry on its scientific side doubts the value of model experiments. Moreover, with several of our rivals not only in possession of a right of access to tanks, but also rather freely exercising it, research of this particular character is rapidly becoming a necessity of the industry. Yet when all is said that can be said about the value of tanks, the fact remains that the people who are least sensible of it are those who should be most sensible. Shipowners and shipbuilders have very little use for scientific research judging from the fact that they do not give Mr. Baker sufficient work to keep even his reduced war staff in full employment. They ought, of course, to take a very different view. But they do not, and until they do, it is to be feared that the Newcastle, Glasgow and Liverpool movements for tanks will make little headway.

Alteration of Pitch.

A torpedo boat destroyer of 14,000 s.h.p. built for a foreign navy and fitted with the Parsons three screw arrangement, ran her acceptance trials. She had the usual h.p., h.p. cruising, m.p. cruising and two l.p. and two astern turbines. On docking for examination after the trial her centre screw was found to be badly damaged. As one of the blades was cracked to the root, it was decided to attempt to burn a new piece in. This was unsuccessful, and a spare screw of a slightly different pitch was fitted, this being the only one available at the moment. The centre starboard screws were right handed and the port screw left handed. A new trial was now run, but it was found that at about one third full speed the centre shaft bearings rapidly heated up, especially the after ones. The ship returned and docked, the centre screw was removed and placed on the starboard shaft and the starboard screw (of correct pitch) placed on the centre shaft. A further trial was now run and proved quite successful. Many theories were advanced, but no definite conclusion arrived at. The practical fact, however, remained that, with centre and starboard screws of the same pitch, and port screw of different pitch, satisfactory results were obtained. No reliable data could be ascertained as to the relative steam consumption of each shaft under the new conditions and no apparent difference was observed.

Mysteries. Propeller

Captain Dyson has contributed to last month's number of the Journal of the American Society of Naval Engineers, a paper on the "Mystery of the Screw Propeller." Captain Dyson has been a prolific writer on the subject within the past few years, and he is continually bringing out fresh methods for arriving at the proper dimensions of screws. The generally accepted method of arriving at propeller dimensions is to determine the conditions under which the propeller is to operate, and then from the experimental data provided by Froude and Taylor, to arrive at the screws to fit these conditions. Thus, if a proper computation can be made of the wake speed, of the power the propeller is to develop, and the revolutions required for a certain definite speed, the problem can be solved from propeller curves. Captain Dyson has, however, tackled the subject from the actual results of many trials, and has striven to combine in a few charts the performances of these full-sized screws. His attempts to bring harmony out of all these results have led him to adopt a number of novel schemes and terms, which do little to make "the mystery of the screw propeller" much clearer to the average person. From the figures he gives in this latest paper, it is clear that by his methods of design, the performances of many screws can be closely predicted. There are some statements in this paper, however, which are difficult to believe. For example, in a certain destroyer the placing of propellers only 4 in. further forward on the shafts brought about a reduction in power for a certain speed of 700 h.p. This is certainly one of the mysteries which requires some illumination.

The Design of the Crank Shaft.

A United States Naval Appropriation Act provided for two twin-screw ships designed to carry fuel and minor supplies for the fleet. One of these vessels, the *Kanawha*, is propelled by two triple-expansion steam engines of 2,000 i.h.p., whilst the sister vessel *Maumee* is to be equipped with two Diesel engines of 2,500 b.h.p. each. Details of the propelling machinery of the last-named vessel are given in a paper by Lieut. T. W. Nimitz, of the United States Navy, before the American Society of Naval Engineers. The main crank shaft is formed in three interchangeable sections. It is 16·353 in. in diameter and made of special forgings, which have the following characteristics :—Tensile strength, 71,000 to 78,000 lb. per sq. in. ; elongation, 18 to 20 per cent. The bending test provided that the bar should be bent round an angle of 180 deg. whilst cold. The sections of the shaft are hollow bored and drilled for the forced lubrication system, the oil entering the main bearing journals from the lower main bearings. The sections are so bolted together that the sequence of the cranks, turning outboard, is 6, 1, 4, 5, 2 and 3. Counterweights are bolted and keyed to each crank shaft opposite the crank pin, and a flywheel, used also as part of the turning gear, is secured to the after-end of the after-section. The flywheel is made in halves keyed and bolted together in order to facilitate handling in the ship if it ever becomes necessary to remove it.

A Feature of Oil Fuel Burning.

A characteristic of boiler performance where oil is used as fuel is the condition known as "panting," which is said to be due to the feeding of an excessive amount of oil—that is, more than the air-supply can burn at the velocity at which it is being fed to the boiler, and this is the most injurious factor in oil burning. It is a condition that should never be allowed to continue, for it shakes down the brickwork, loosens the joints in the casing, and racks the boilers, the connections and the ship itself in a highly injurious manner. The author of a paper on "Oil Burning," which appears in the Journal of the American Society of Naval Engineers, in commenting upon this condition of working, states that it can be overcome by increasing the velocity of air, by slightly closing the registers, cutting out burners, or increasing the air pressure by speeding up the blowers. Within limits the latter is the quickest and most effective measure and the one chiefly employed in manœuvres, and in this connection it may be said that putting both blowers on a common throttle has tended greatly to increase the efficiency of a stokehole with two blowers, as it ensures their being speeded up together, and in so doing prevents the increased pressure escaping through the slow burner, as occurred before this was done. Panting is also frequently caused by an insufficiency of air in the "banks," which latter should always be charged as soon as there is steam on the ship. These air banks should show half a glass of air at working pressure, and must be pumped up frequently, as the oil absorbs the air.

Critical Speed of Rotor.

A point of especial importance for consideration in the designing of high speed turbines, is that of the critical speed of the turbine rotor. If a shaft resting on two supports be subjected to a blow between the supports, the shaft will be put into a state of vibratory motion, the frequency of which will depend on the condition of the supports and the inertia of the shaft. The frequency or period of vibration for a particular shaft is constant and independent of the applied force, but the displacement depends on the magnitude of the force. If this shaft be now subjected to a series of blows of the same frequency as that natural to the shaft, it is seen that their continued application, however small, will produce a gradually increasing amplitude of vibration, and may ultimately rupture the shaft. In a turbine

rotor in which the shaft is deflected under the weights of the various parts, centrifugal forces are brought into play about the axis of rotation, and acts on the shaft in a manner similar to that of a succession of blows applied to it, and if the period of the blow, or the period of revolution of the rotor synchronises with the natural period of the shaft, then excessive and dangerous vibrations of the rotor will ensue. This period of revolution of synchronism is called the first critical speed of the rotor. In marine work in which steadiness of running at all speeds up to the maximum is desired, it is imperative that the critical speed should be higher than the maximum speed of revolution. In general practice it is usual to design for a critical speed of about 50 per cent. above that of the working speed. In cases in which the turbines are run always at a constant speed as in turbo-generator sets, the working speed is often higher than this critical speed, but care must be taken that the working speed does not synchronise with the higher critical speeds which are multiples of the first critical speed.

THE GOVERNMENT AND SHIPPING PROBLEMS.

OBVIOUSLY one of the paramount needs of the moment is to maintain a just balance between the requirements of the military forces and the essential economic necessities of the country. A wise statesmanship will ponder constantly on such problems and in doing so it must recognise the peculiar position of the transport industries amongst which shipping occupies a most important place. The shipping side of these problems was raised in the House of Commons on two occasions last week—on one occasion with special reference to the supply of labour at ports and on the other in relation to the distribution of merchant ships between military and civil employment.

In approaching the first aspect of the problem we do not wish to enter into the controversial merits of compulsion and voluntary service. What we direct our attention to is the cardinal question —which is as much a cardinal issue in conscriptionist countries as here—what supply of labour must be reserved in civil employment to support the armed forces in the field and to maintain on a restricted scale the national economic life. The reason why Germany does not experience our difficulties in respect to sea-borne commerce is that German commerce has practically vanished from the seas. We had complaints in the House of Commons last week about the scarcity of labour to discharge vessels and to keep the transport facilities clear. These complaints refer to a time when Lord Derby's scheme had not begun to operate. We note in passing that dock and wharf labourers and certain other categories of labour employed in and about a port are classified amongst the reserved occupations of cardinal importance for the maintenance of some branches of trade and industry. Whatever protection that may prove in the future it does not materially influence the situation yet.

Let us look at some aspects of the present situation as put before the House of Commons. Mr. Holt confessed for example that as a shipowner he could not get more than half the men either in London or in Liverpool which he required for the purposes of his business. He mentioned dock labourers and carters as instances. The Liverpool dock authorities, we know, think that it is impossible to keep the port clear if any more labour is taken away from them. But the problem is not confined to London and Liverpool. Mr. Samuel Samuel gave an example in regard to a steamer of 5,400 tons at Hull. In normal times the vessel would be unloaded in six, seven or eight days. She has already been at Hull for a month and it will probably be early in January before her cargo is cleared. The difficulty is one of labour. Such congestion, according to Mr. Samuel, diminishes the effective value of tonnage by one half. Mr. Holt says that ships are leaving behind goods which are ready for transport, but it is impossible to get them on board.

This constitutes a most serious problem even from the point of view of the conduct of the war. The essential industries of the country, the industries which feed the war, are dependent on shipping in important respects for the free flow of raw material. To keep the ports clear is thus doubly important. There are two ways in facing such a problem. You must maintain a sufficient civil labour supply exempt from military service or you must provide a certain labour supply from men who have been incorporated in military service. The labour must be obtained if the situation is to be tackled. We hope that the Derby scheme may be manipulated in such a manner as to avoid at least making matters in this respect worse than they are.

Mr. Runciman, as President of the Board of Trade, has had this vital question more directly brought to his attention than has any other cabinet minister. Considerable importance on that account attaches to his speech on the motion authorising the addition of a million men to the army. He gave his assent to the withdrawal of these men from the productive resources of the country, but he added that a million was as many as could at present be allotted for military service in order to maintain the best national result. No doubt after the success of the Derby scheme in the matter of the actual numbers of men enrolling, that million can be passed into military service. But the greater number of soldiers we have the greater energy must there be to maintain them and equip them. Without full equipment they could not yield full advantage to the country, and any serious lack of resources from which the equipment could be drawn would make them an unremunerative drain on the country.

Economic considerations are therefore relevant, and we need scarcely argue the simple proposition that our economic resources are vastly enhanced by the efficient management of all our available merchant ships. Mr. Runciman said with unanswerable force that one of our national needs as a maritime country was to see that supplies came freely in and went freely out, that our ships passed in and turned round rapidly and by that means they could best serve us against the enemy. By withholding licences from British ships to trade between one foreign port and another a large amount of tonnage has been diverted to British ports. The number of such licences up to December 20 was 118. We want this diverted tonnage to become wholly effective, but the maintenance of the efficiency of our mercantile marine involves something more than reserving from recruitment the officers and men engaged in navigating vessels. It requires permanent preservation of an adequate labour force to operate the ports quickly and efficiently. Mr. Runciman pointed out that this included not only manual labourers but shipping clerks and those accustomed to direct shipping enterprises.

Every one appreciates the patriotic sentiments of men who are anxious to engage in military service, but Mr. Runciman is right when he points out that there are branches of national service besides military service. We do not think that we prejudge the issue between compulsion and voluntary service when we lay stress on a wise distribution of the manhood of the country between the fighting forces on the one side and the economic resources on the other. We sincerely trust that the Government will get all the soldiers it deems needful, but under whatever system it gets them, we hope that the men who can best be spared will be the first to go.

Now to pass to another aspect of the shipping problem, the withdrawal of ships for military and naval uses, we are faced with the fact that we have fewer ships than we need for commercial purposes. Perhaps it was inevitable that some dissatisfaction should have arisen in regard to the use of mercantile tonnage by the Admiralty, and we are not altogether convinced even by the speech of Mr. Balfour, which we publish on page 585, that in some instances more discretion could not have been displayed in the use of ships. We admit freely that Mr. Balfour's defence in its general principle is unanswerable. Military and naval considerations must be supreme. Mr. Balfour said that when transports were used

for military purposes their use must be subordinate to what the generals on the spot conceived to be the necessities of the situation, and all that could be done was to impress as far as possible upon those who conducted the military operations the extreme desirability of using every means in their power to save tonnage in the general interest. We hope that the idea of saving tonnage in the general interest has now made a deep impression on those authorities. Mr. Balfour remarked very truly that the Admiralty must deal with transports differently from the manner in which a prudent and expert shipowner viewing his own business interest would use his ships. Delays, he admits, are serious, but they are not avoidable. We cannot assent fully to his proposition that this state of things could not be cured by shipowners sitting at Whitehall. Perhaps it could not be cured, but we feel sure that some inconveniences could be alleviated by bringing into consultation more men whose lives have been spent in the successful management of ships—*and acting on their advice*. Undoubtedly the Transport Department, which finds the vessels for the requirements imposed upon it by the naval and military authorities, has greatly benefitted from the advice of a competent advisory committee of shipowners. From the Secretary of the Admiralty we have the assurance that the department does release and will continue to release requisitioned units whenever and as soon as military exigencies permit.

Again in the House of Commons a plea has been put forward that the Government should take control of the mercantile marine. The rise of freights and their effect on the price of commodities are the arguments used in support of the claim. Mr. Balfour did not give much encouragement to the demand, and advised the House to weigh the enormous difficulties in the way of such a project. In saying that he did not reject it as absolutely impossible, we take it that he meant that in times of uncertainty like these we should not dismiss the remotely possible as impossible. There was sound sense in his suggestion to the House that one way of mitigating the situation to some extent was to pass rapidly the Munitions Bill which would permit the building of merchant ships as war work.

All these problems we have referred to are complicated and we trust that none of the factors in the situation will be lost sight of by the Government in whatever decisions it may take.

LUBRICATING MARINE ENGINES.

A PAPER entitled "Practical Lubrication" was contributed recently by Lieutenant G. S. Bryan, of the United States Navy, to the American Society of Naval Engineers. This paper deals with various aspects of the subject of lubrication, the characteristics of the oils used and the conditions which they have to meet. The author lays stress upon the effects produced by high temperatures on the action of the lubricant, and goes on to consider the best means of dealing with friction in bearings and also the treatment of rubbing surfaces in contact with steam.

The author points out that the first effect of high temperature in a bearing is to thin the oil and thus decrease the friction. The effect of cooling the bearing is to increase the friction. There is no virtue in keeping a bearing at a very low temperature by the use of a considerable amount of cooling water, and there is no reason why a bearing should not be allowed to run at a high temperature as long as it is in good condition and is getting plenty of good, clean oil.

The principal reason why a hot bearing is so feared is that it is generally an indication that something is wrong with the bearing or that it is not getting sufficient oil. Possibly this is a good reason for not allowing bearings to run at very high temperatures, but there is no excuse for going too far the other way and keeping them too cool. Cooling a bearing below a fair working heat by flooding it with oil results in a waste of oil, and keeping it cool by circulating a large amount of cooling water around it results in a waste of power. However, in case a bearing heats up due to the presence of dirt or foreign matter, an increased supply of oil may be necessary to wash this dirt out of the bearing.

Theoretically the total friction in a perfectly lubricated bearing is independent of the load that may be put on the bearing. This may appear surprising, but it nevertheless is true, and can be easily demonstrated. In practice, while we do not find this rule to hold exactly good, we do find it approximately so. The coefficient of friction drops very appreciably with an increase in the bearing pressure, the coefficient of friction being defined as the ratio between the total friction and the total load.

The principal danger of increased load on the bearing is not that it directly increases the friction, but that it tends to squeeze out the oil from between the journal and bearing and thus destroy the lubrication. Generally speaking, the lighter (less viscuous) the oil the easier it is to squeeze it out. It can be easily seen that the facility with which the oil is squeezed out naturally acts to increase the amount of oil used, since the oil forced out must be replaced by fresh oil. Forced lubrication is used mostly in the Navy now, and the loss would also be increased in this case by the more rapid circulation of oil through the system, since this would increase the leakage from imperfect joints, and splashing of oil into the bilges by engine cranks, &c. This has caused many engineers to change to a heavier oil as a matter of economy.

In turbine bearings the best conditions are obtained for the use of light oils. Here the speed is high and the bearing pressure is not only small, but is also steady and uniform in character. In a reciprocating engine the rubbing speed is much slower and the pressure on the bearings intermittent in character. The reciprocating action intensifies the bearing pressure and the squeezing-out effect, but has the saving quality that while this pressure is on one side of the bearing the oil film is given an opportunity to form on the opposite side and be ready to meet this. On account of the above action that takes place in a large reciprocating engine bearing we need a fairly heavy oil to give an increased "cushioning" effect and to prevent wasting the oil. The limit of viscosity in forced lubrication systems is set by the inability of the oil pumps to handle a too heavy oil. With engines not fitted with forced feed lubricating systems it is set by the ability to feed properly.

Turbines fitted with forced feed systems give the nearest approach to perfect lubrication. In case the bearings heat up it may be due to grit getting in the bearing, and in this case the pressure on the system can be increased with the hope of forcing this out. The increase in pressure does not lessen the friction, though it does assist in carrying off the heat generated by friction, and keeps the bearing slightly cooler.

In steam cylinders the oils are subjected to the high temperatures of the steam, and if their flash point is not sufficiently high they will vaporise, and therefore cannot adhere to the cylinder walls. Also their viscosity must be great enough to withstand this high temperature without their getting too thin. A cylinder oil should, therefore, be selected with reference to the pressure and temperature that will be encountered.

When wet steam is used there is always some condensation on the cylinder walls, and this is liable to wash the oil off if a pure mineral oil is used. To prevent this it is usual to add a small percentage of tallow or lard oil to the cylinder oil to cause it to emulsify and stick to the surfaces similar to the action of a marine-engine oil. The objection to this is that the fatty oil (tallow) will get in the feed water through the condenser and liberate fatty acids in the boilers, thereby causing increased corrosion and scale. On this account only pure mineral oils are allowed to be used in steam cylinders in the naval service. In fact, practically no cylinder oil at all is used in the steam cylinders in the naval service, the wet steam itself furnishing what lubrication is necessary.

For superheated steam no condensation on the walls is available for lubrication and the need of oil is therefore much greater. There is no danger of the oil washing off, however, for the same reason, and a straight mineral oil should be satisfactory. The temperature of

superheated steam is, of course, higher than that of wet steam and a higher flash point is necessary.

In forced-feed lubrication conditions are different, and emulsification is always objectionable. In addition to increasing the friction and giving less lubrication the water corrodes the journals, and the rust thus formed gradually accumulates in the oil, causing additional wear on the bearings. The so-called "dirt" that accumulates in the oil is principally iron rust.

For this reason it is extremely desirable to get rid of, as soon as possible, any water that does leak into the system. The only practical way is to heat the mixture in the settling tank and draw off the water. Some engineers have an idea that the oil should be allowed to cool after this heating before the water is drawn off, but this idea is erroneous. The settling out is practically all done while the mixture is hot, and waiting for it to cool has little or no effect.

The water will settle out best at a temperature just below the boiling point of water. If 212° Fahr. is exceeded steam will form, and this will serve to agitate the mixture. A temperature of 200° Fahr. should not have any bad effect on the oil. The oil should be cooled before being supplied to the bearings, however.

If marine-engine oil gets in the forced-lubrication system there is a tendency to form a thick, heavy emulsion which gives great difficulty in settling out. Some cases have been known where tallow, which had been put in bearings when a ship was laid up, was allowed to get in the forced-feed oil, and this resulted in the formation of a heavy emulsion which would not settle out.

Every effort should be made to get rid of the dirt in the oil and the strainers should be frequently cleaned. If water is kept out of the system most of the dirt will be automatically eliminated.

U.S. SHIPBUILDING.

The Bureau of Navigation, Department of Commerce, reports 70 sailing, steam, gas, and unrigged vessels of 23,841 gross tons built in the United States and officially numbered during the month of November, 1915, as follows:—

	Atlantic and Gulf.		Pacific.		Porto Rico.		Great Lakes.		Western Rivers.		Total.	
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Wood.												
Sailing	2	1,470	1	15	...	...	...	...	...	...	3	1,485
Steam	4	369	...	...	...	...	...	...	2	55	6	424
Gas	11	191	5	149	...	...	20	257	6	82	42	679
Unrigged ...	...	...	9	2,746	...	...	...	...	3	24	12	2,770
Total	17	2,030	15	2,910	...	...	20	257	11	161	63	5,358
Metal.												
Sailing	...	...	...	..	...	...	...	...	...	...	...	...
Steam	3	13,281	...	...	..	...	2	4,603	...	...	5	17,884
Gas	...	...	...	...	...	...	...	...	...	...	..	...
Unrigged ...	1	560	...	...	...	...	1	39	...	...	2	599
Total	4	13,841	...	...	...	...	3	4,642	...	...	7	18,483
Totals.												
Sailing	2	1,470	1	15	...	...	...	...	...	...	3	1,485
Steam	7	13,650	...	...	...	...	2	4,603	2	55	11	18,308
Gas	11	191	5	149	...	...	20	257	6	82	42	679
Unrigged ...	1	560	9	2,746	...	...	1	39	3	24	14	3,369
Grand total ...	21	15,871	15	2,910	...	...	23	4,899	11	161	70	23,841

ALTERNATIVE TYPES OF PROPELLING MACHINERY FOR A 19¼-KNOT STEAMER.

Mr. Dornan Replies to Discussion.

At the monthly meeting of the Institution of Engineers and Shipbuilders, in Scotland, held last week, Mr. James Dornan, writer of the paper on "Some Alternative Types of Propelling Machinery for a 19¼-Knot Steamer," replied to the discussion on the paper, which was reported in our last week's issue. The paper itself was published in our pages on November 18.

Mr. Dornan said:—While nothing has been produced in the discussion to cause the amending of any of the arithmetical results as detailed in the tables, it is clear that my lack of literary powers has misled my critics when they read the text. The omissions and qualifications of the latter will be referred to later, for it is necessary immediately to deal with the charge which was made by Mr. MacLaren and elsewhere that my paper is of a speculative nature. Such is not the case, as can be shown by comparing the anticipated results of the various designs with what one usually finds in practice on ships of the type considered. Designs "A" and "C" are familiar to all, and no difficulty should be experienced in attaining the calculated economy, weight and performance. Results of designs "B" and "D" are easily deduced from those of "A" and "C," and call for no further comment. Mr. Portham's confirmation of "B" is here welcomed, as I was not aware superheated steam had been used in such large reciprocating engines as 30,000 i.h.p.

The turbines and transformers of design "E" are identical in power and dimensions to those tested last year by our enemies, when a better result was obtained than is claimed in this paper. There can, therefore, be no doubt that designs "A," "B," "C," "D" and "E" are not speculative. The machinery for either "F" or "G" has certainly not been constructed to date, but that is no reason why it should not be in the future. The dimensions, economy and performance of each have been deduced from the published data of 900-h.p. steamers fitted with the respective types of machinery. For "F" the type ship is the *Vespasian*, and for "G" the ship is the *Mjölner*. The results obtained on the trials of these ships have been made public, and their subsequent performances at sea bear out the figures obtained on trial. It is, therefore, submitted that the claims made for any or all of the designs are not contrary to reason. The reasoning which produces the results of "A" can also produce the given results for the other designs. Allowance was made in every case for the increase in fuel consumption at sea, so that when new and on trial each of the designs would show a performance better by, say, 6 per cent. than that shown in the tables.

The steam consumption of the Ljungström unit is real, as is confirmed by Mr. Portham's figures for a 7,000-h.p. turbine at 40 per cent. full power. It can also be proved by the very high "K" values associated with Ljungström turbines. With reference to the brake efficiencies shown in line 14, Table III, it should be explained that these are not the conventional efficiencies, as they have been calculated only for the purpose of estimating the period for depreciation. They, therefore, exclude the losses in the steam pipes, valves and condenser. If these losses be taken into account the actual thermal brake efficiency will be found to be a few per cent. lower than stated in the table.

Regarding Mr. R. T. Chalmers Black's contribution to the discussion, the details of the electrical and other reduction gears were omitted as the paper would become unwieldy. It is to be hoped Mr. Portham will fully describe in his paper to be read here later the details required by Mr. Black, but I would mention that a 1,100 b.h.p. Ljungström turbine is now waiting test where an astern turbine of the double-rotation type is incorporated in the ahead casing and on the ahead discs. It has double reduction helical

gearing, the first reduction being 4,500 to 450, and the second 450 to 80 r.p.m. The object of this is to show that the turbine in question can also, if desired, be constructed for use with helical gearing. As the fitting of the astern turbine in this case precludes the use of highly superheated steam, Mr. Black will probably admit that the gain in mechanical efficiency from, say, 88 per cent. of a corresponding turbo-electric drive to 95 per cent. for the mechanical gear drive is somewhat counterbalanced by reducing the degree of superheat from 260° Fahr. in the former to, say, 120°–150° Fahr. in the latter. It may interest Mr. Chalmers Black to learn that the r.p.m. of the two turbo-alternators on board the 900 shaft horsepower steamer *Mjölner* are 7,200, which equals 14,400 relative r.p.m. He will also be glad to learn that in addition to his own reason a double reduction gear was necessary in design "G" to give the best overall results. To obtain in the ship considered a propeller speed of 85 r.p.m. with turbines—no matter how geared—double reduction gears are required for a successful design. Mr. MacNicoll has in part appreciated this, whilst Mr. MacLaren is evidently prepared to design an installation of mechanical geared turbines with 85 r.p.m. propeller speed. The latter gentleman did not, it is true, definitely state he proposed, to use double reduction gears, but a few movements on a slide-rule would show that single gears are not suitable for this design on account of the turbine revolutions involved when the propeller runs at 85 r.p.m.

Whatever the future may hold it must be remembered our present knowledge of gearing would scarcely justify Mr. MacLaren in going forward with a double reduction gear of 11,000 shaft horsepower per shaft. In design "G" the difficulties involved have been overcome by making the first reduction on ordinary gears with teeth made strong enough by increasing the pitch over that usually found in marine gearing, and the second reduction is done electrically in the manner indicated.

Both Mr. MacLaren and Mr. Portham wish to know why the revolutions of "F" were not made the same as "E." The answer to this is that both designs are for geared turbines, and surely it should be the object of a designer to fully utilise the essence of the respective inventions and take full advantage of their property of producing the lowest speed of propellers. In my opinion, 200 is the most suitable rate of revolution for "E" and 160 for "F."

Had Mr. MacLaren studied my paper he would have learnt, amongst other things, that only in the saturated steam designs was the boiler efficiency constant. He would also have observed that in the designs involving superheated steam the efficiency gradually falls with increase of superheat until in "G" the evaporation per pound of coal is 5 per cent. lower than in "A" or "D." Notwithstanding this loss it still pays to use superheated steam. My recommendation of higher slip ratios was intended to refer to ships with direct-coupled turbines.

I am indebted to Mr. Hillhouse for his appreciative remarks and regret not making the text of the paper as clear as it might have been. The e.h.p. was calculated from Taylor's curves, which, as Mr. Hillhouse states, refer only to the naked model. A deduction was made for the four-shaft ships as the form is better on account of the four shafts. The amount of the deduction was estimated from the results of tank experiments published within the past few years in papers read before the English technical societies. These results are of considerable value from a comparative point of view, since they show the effect, in horse-power, of altering various parts of ship's body with displacement remaining constant. The effect of bosses was estimated from the figures contained in papers read before our Institution and other societies.

My statement regarding constant moment of machinery requires modification. The actual v.c.g. of machinery varies from 17·6 to 19·3 ft., and only in those designs having a strong family resemblance is the moment anyway near constant.

Mr. Hillhouse draws attention to the gain in deadweight not being proportional to the gain in cubic capacity. This is so, and it could hardly be otherwise. In a ship of the class considered, capacity is far more important than deadweight, as most goods are paid for by measurement rather than weight. Again, the required deadweight could be carried at the stated speed by a ship of very much smaller dimensions than those in Table I, if weight alone was the chief consideration. In this ship, however, the number of passengers to be carried controls the dimensions and any extra volume that can be obtained by altering the type of machinery is of value, independent of the rate of stowage.

A weekly shipping paper raised the question of the coal consumption of the quadruple-engined design as compared with the recorded coal consumption of the *Saxonia's* machinery in the Navy Boiler Committee trial. The steam consumption, all purposes, for the *Saxonia* was 14·59 lb. per i.h.p. hour against my estimate of 14·72 lb. for "A." These figures show that the recorded economy of the former ship was entirely due to her boilers. The respective boiler efficiencies are 82 and 73 per cent. for *Saxonia* and for "A." It may be left to practical men to decide upon which of these two values an estimate should be prepared.

THE UTILITY OF THE WILLIAM FROUDE TANK.

Conclusion of the Discussion on Mr. Baker's Paper.

Continuing our report of the discussion on Mr. Baker's paper read at the North-East Coast Institution, Mr. Summers Hunter remarked that in the past this country had been pre-eminent in shipbuilding and engineering. In the future, with the markets of the world before us, we must be supreme. To attain that position, we must no longer rely upon rule-of-thumb methods or upon copying or making use of what someone else had done under different conditions. Mr. Baker's paper was, probably, the most valuable paper on that subject that had been read before that or any other Institution, and the value of the paper had been enhanced by Sir Archibald Denny's remarks. The paper came at an opportune moment. We had to prepare for keener competition, as to shipbuilding and marine engineering, with Continental countries. The majority of shipbuilders in this country either were, or soon would be, in competition with other countries already in possession of suitable public tanks, which they were well able to use. The reason which appealed to him more than any other as to the necessity of a tank on the North-East Coast was that the Chair of Naval Architecture at Armstrong College could not be considered complete until such a tank was available. Mr. Baker had given him some information as to the tanks in other countries. For instance, there were at least two public tanks in Germany, with another building at Hamburg and a fourth at Vienna. The Hamburg tank would be national, but that was not certain so far as the Vienna tank was concerned. He could say, from personal experience, within the last few years, that the Austrians and Hungarians were taking a very keen interest in shipbuilding developments, and had been careful to secure the best shipping possible. In this country, we had four private tanks—Clydebank, Denny's, Haslar and Vicker's—and only one public tank, that superintended by Mr. Baker. There was also one large public tank in each of the following countries: France, Russia, Italy and Japan. There were two in America and a third was in contemplation at Massachusetts. Both of the American tanks were available for any firm. The four small privately-owned tanks in this country had not, so far as he knew, given much information to the public. It was not to be expected that they would. A firm or an individual, having spent money on a branch of a business which eventually became an almost invaluable asset, could not be expected to give away what had been gleaned by that expenditure.

Personally, he had had two experiences of competition with tank experiments, and in each case their competitors were German shipbuilders. In one case, a Continental owner had received quotations for his vessel from shipbuilders in this country and on the Continent. The speaker's firm were interested in the engines. During the negotiations, the firm was told that their power and sizes were larger than those of certain Continental competitors, and that remark applied to certain shipbuilders in this country, so that, if there were a mistake as to the sizes of the engines, it applied to all the shipbuilders, both on the east coast and on the west. After the business was completed, he inquired more fully into the position and was told that, of the German shipbuilders who were their competitors, two based their proposal upon tank experiments, and, as a result, one of them got the order for two vessels. The proposals of both firms were practically on the same lines. In another case, there was a large steamer required by an English owner. In that case, an inquiry had been sent to German shipbuilders who, having a tank, made experiments, and put a proposal before the English owner based on tank experiments. In that case, the English owner, greatly to his credit, was able, with the information he (the owner) was able to give, to place the order in this country. Economical results were obtained by putting in special machinery and the final results were, approximately, equal to what the Germans had guaranteed.

Mr. A. W. Johns, R.C.N.C., Admiralty, wrote remarking that the increase in the resistance of a model by the introduction of lapped edges and butts looked alarming. The results showed the increase with lapped edges to be 3·6 per cent. of the frictional resistance, and with lapped butts 6·7 per cent. These results would appear to need some modification when applied to the ship, especially in the latter case, where the resistance was wholly eddy resistance. It was difficult to obtain figures which showed the effect of size and speed on purely eddy resistance. The results given by Mr. Baker for struts were of resistance which was partly skin friction and partly eddy (or form) resistance and were not, therefore, strictly applicable. Mr. Eiffel, in his latest book, "Nouvelles Recherches sur la Resistance de l'Air, &c.," gave the results of experiments on three spheres respectively 6·5 in., 9·8 in. and 13·2 in. diam. At a speed of 4 metres per sec., the coefficients of resistance were respectively $3\frac{1}{8}$, $2\frac{1}{2}$ and $2\frac{1}{4}$ times the coefficients at 16 metres per sec. In the case of the spheres, the greater part of the resistance was due to eddy making and one noticed that the smallest diameter gave the greatest variation of the coefficient as the speed was increased. It was, therefore, reasonable to suppose that, passing from the lapped butts of the 16-ft. model to those of the 400-ft. ship, moving at five times the speed, there would be a very considerable diminution in the percentage increase of the resistance due to those butts. One imagined that it would come down to, possibly, 1 per cent. increase, or even less. The resistance curves of the struts given were instructive. The results for the larger struts agreed with those obtained by M. Eiffel for Farmen aeroplane struts. In the case of struts, the resistance was partly skin friction and partly eddy (or form) resistance, with the former considerably greater than the latter for the sections shown. The curves of resistance should, therefore, be of precisely the same nature as those for skin friction of planks. The information given in the paper carried their knowledge of skin friction resistance a step forward, and also showed how useful to the naval architect was a knowledge of the results obtained by the various aeronautical laboratories. The latter point had been emphasised by the present writer in papers read before the Institution of Naval Architects in 1904 and 1915. After reading the paper, one was forced to the conclusion that much experimental work had yet to be carried out before our knowledge of skin resistance of ships was placed on a correct basis. The method now employed for computing that resistance of a ship by assuming it to be the same as that of a plank of the same wetted surface and length was very approximate. The effect of curvature on the bottom was neglected, and one felt that that procedure involved far greater errors than those due to neglecting the effect of edges, lapped butts or similar irregularities. He was aware that Mr. Baker had touched on that point but he hoped that, later on, the Wm. Froude tank would be able to throw far more light on that practical problem.

Mr. G. F. Davidson (Leeds) wrote stating that wave resistance, of course, followed the $\frac{V}{\sqrt{L}}$ law of similarity, while skin friction, eddies due to struts, &c., the energy spent in pushing the water aside as the vessel went forward all followed the $\frac{VL}{\sqrt{\ }}$ law. Now, in a good model, that last resistance was probably small; in a punt it was probably large. But it could be treated separately by that means instead of lumping it with skin friction. If that resistance were appreciable they should pay more attention to the shape of water-lines at the shoulders, *i.e.*, near the parallel middle body, for example, so as to be sure that the acceleration of the water perpendicular to the motion of the ship did not vary rapidly. In any case, however, the idea of running a double model submerged, so as to get no wave formation, was so simple that perhaps Mr. Baker would tell them if it had already been done.

Mr. H. G. Williams wrote observing that, ever since Dr. Stanton, at a meeting of the Institution of Naval Architects in 1912, drew attention to the correct dimensional law of the frictional resistance of fluids, there had been an obvious necessity for the reconsideration of the published experimental results on that subject and of the methods which had been employed for extending those results to ship-shaped forms and to dimensions and speeds beyond those covered by the experiments. Mr. Baker, in carrying out that work of reconsideration, had earned the gratitude of naval architects. The results of additional experiments were a valuable addition to scientific knowledge. It was satisfactory to know that W. Froude's actual experimental results conformed to the correct theoretical law of frictional resistance. The resistance of struts and other appendages was of much greater relative importance in the case of submarines, running submerged, than in the case of ordinary surface ships, and if Mr. Baker could see his way to carry out investigations which would give average values for the open water resistance of the types of excrescences usually found on submarines, together with average values of the appropriate wake corrections, he would earn the gratitude of submarine boat designers. Mr. Baker's remarks on the uncertainty which attached to the meaning of the terms "straight" and "hollow" lines were well warranted, and data given of the variations in resistance due to variation in the hollowness of lines were not of much practical use unless accompanied by offsets of the lines. The hollowness of bow lines might be defined to some extent by the prismatic coefficient of the forward half of the fore body, though that method would lack precision, except for a standard shape of profile.

Mr. Robert Hinchliffe, of Sir W. G. Armstrong, Whitworth & Co., Ltd., said his feeling was one of dismay when he realised that Mr. Baker threw doubts, not upon the actual experiments of Mr. W. Froude, which had been substantiated by several experimenters, but upon the extension of those results of lengths of surfaces beyond the limits of the experiments in the manner proposed by the Froudes. One naturally felt upset when told that a method which one had used with every confidence for some considerable time was not accurate. Being chiefly interested in warships, he had tried Mr. Baker's new curves upon four typical vessels—the first, a destroyer of 1,000 tons displacement and 32 knots speed. The skin resistance, using Mr. Baker's smooth surface curve, was 4·8 per cent. less and the total resistance 1·5 per cent. less than the figures obtained by using R. E. Froude's values. For a second-class cruiser of 4,000 tons displacement and 29 knots, the skin resistance was 10·5 per cent. less and the total resistance 4·5 per cent. less. For a battleship of 27,000 tons and 24 knots, the skin resistance was 13·25 per cent. less and the total resistance 7·33 per

cent. less. For a battle-cruiser of 30,000 tons and 28 knots, the skin resistance was 14·6 per cent. and the total resistance 9·0 per cent. less. It would be seen that, whilst the difference for short ships was comparatively small, it was appreciable in the case of long ships. If Mr. Baker's curves were correct, they had, in the past, been considerably over-estimating the effective horse-power of long ships, and their propulsive coefficients based thereon were all too high. The very limited data in his possession did not bear out that result, for, whilst propulsive coefficients for large ships tended to be slightly higher than those of small ships, the difference was not more than would be expected from the greater seaworthiness and smaller percentage of appendage resistance in the large ships. An examination of Mr. Baker's method of arriving at his results, however, did not give much hope for upsetting his conclusions. Altogether, the matter was most disconcerting. If Mr. Baker's results were correct, the method of estimating effective horse-power, based upon Froude's constant system, was incorrect. All the data based upon that system, upon which many of them had spent much time, was wrong, and all their propulsive coefficients were false. The greater portion of the data dealing with model results in technical works was based upon wrong assumption. With reference to the resistance of struts, he was informed by his chief, Mr. Perrett, that a very similar series of experiments was carried out by Mr. Froude when that gentleman was associated with Mr. Perrett some 30 odd years ago, and the results obtained were very similar. To the best of his knowledge, Mr. Froude's results had never been published, and the lessons to be learned from them, judging by results published by experimenters in certain foreign tanks, were not generally known. Mr. Baker's experiments provided them with a method whereby a reasonably close estimate might be made of the resistance of the strut arms in the full-sized ship. When that was done, however, there still remained the resistance of the strut barrel, the shafting and stern tube bossing, which was still indeterminate at present and the effect of which would still have to be covered by the propulsive coefficient.

Mr. Baker replied briefly to the discussion. It had been so long, he said, that he could not cope with it that night. He thought that many of the points raised were answerable. As to the effect of plate edges and lapped butts, he had pointed out that the increase in the wetted surface due to the thickness of ¾-in. plating being exposed along the edge was from 1·5 to 2 per cent. Look at it as they would, they had that large increase in wetted surface and, therefore, in resistance as far as skin friction was concerned. The results in the paper showed an increase of 10 per cent. in the resistance due to plate edges and lapped butts. He had heard nothing to prove that these figures were wrong. When he remembered that Froude was unable to account for 30 per cent. of the resistance which the *Greyhound* developed, he wondered how much of that 30 per cent. was due to the very thick plate edges which the *Greyhound* had. With regard to the question of a tank for the North-East Coast, it seemed to him that, if the German nation, with a mercantile marine that used to be only half of the British mercantile marine, wanted three or four tanks, the British nation wanted quite as many. If the British shipbuilder did not know how to use the tank, that was his misfortune. If the latter wanted to keep in the forefront, he had got to know. As to propulsive coefficients, that was really not a point with which his paper was concerned. It was not his business to account in that paper for the discrepancy, if there were one, between Froude's results and effective horse-powers. The discrepancy was not between W. Froude and their own data at all; these were in quite close agreement. It was merely what he might call the conjectural production of experimental results in order to use them for the ship. W. Froude suggested one method, the speaker suggested another. The purpose of the experiments which the speaker had suggested was to determine which of them was right. Of course, it was possible that both of them were wrong. There was only one way of deciding the matter. That was to tow a boat or to tow a boat deliberately built in the form of a plank. That involved time, labour and money, but, if they wanted information, they had to work for it and pay for it. Somebody should determine what was the frictional resistance of a long body towed at a reasonably high speed. They wanted a boat 250 or 300 ft. long, and wanted to tow it at 10 or 12 knots. If they could get an old mail steamer, such as had been mentioned by Sir A. Denny, a boat of fine lines, which would develop a comparatively small amount of residual resistance, at such low speeds as the speaker had mentioned, they should be able to take off its brackets and tow it. Again, they might build a comparatively flat boat, with only sufficient beam to allow it to stand up. That was, of course, only a repetition of the *Greyhound* experiment, but it was repeating it with a more complete knowledge of what one was searching for and with 40 years' experience to back one. He thought, therefore, that the results would be analysed from a newer and more correct point of view. As regards the instability results at those speeds, that was a point about which they had thought a very great deal. It was essentially a tank problem and not a shipbuilder's problem. It only occurred at very low VL values and, of course, a ship worked at very high VL values. Sir A. Denny had suggested surface tension, but the speaker did not think that that could be it, because the 3-ft. plank which they ran was run at high speeds before they got out of that region where the instability occurred. However, these were matters which required investigation.

— · —

Sir Archibald Denny writes that in our report last week of his remarks the portion referring to bilge keels does not accurately express what he said on that subject. Sir Archibald has kindly sent on a copy of his remarks, from which we publish the following extract :—

" Now as to strut and bilge keel resistance our method of getting this is to fit the struts and bossings and bilge keels (if we wish to make special experiments with bilge keels on the model) exactly to scale subject to removing all causes of eddymaking. Twenty years ago for the purpose of solving the question which Mr. Baker has put to himself as to whether models to scale of such things follow the law, we tried a ship with bossings (she had no struts) on different sized models, varying from 6 to 20 ft., and we found that the law of comparison held; if anything, the larger model showed the greater result for the ship, and we have repeated this trial for another ship recently when the comparison was exactly to the law. Of course, we are driving the struts, &c., through the water as an integral portion of the ship and not dealing with the strut as a separate entity. Our method has given us very useful results in our screw experiments and has enabled us to predict actual ship results with a great degree of accuracy. Again, the total added resistance of tubes and struts combined is not of a large order when well designed. We have not made similar comparative experiments with struts, although we frequently try models with struts, but here again the added resistance as ascertained by our method is small.

" In regard to bilge keels, the series of experiments we have made and our long experience has led us to the belief that bilge keels as ordinarily fitted increase the resistance simply in proportion to their surface. That is the rule we have adopted, and we see no reason to depart from it. I can give you the results of a valuable experiment made on a full-sized ship. This vessel was a cross-Channel vessel, and the superintendent had specified for exceedingly long bilge keels, so long were they that had we put the bilge keel normally on the bilge in the usual diagonal plane the ends of the bilge keels would have come out of the water, so we were obliged to decrease the angle of the diagonal plane, and this gave the bilge keels a most curious appearance—they appeared to droop at the ends. The superintendent was much concerned about this, and said they would add greatly to the resistance of the ship. We told him that our experience did not lead us so to believe; we made experiments in the tank, and from these experiments found that our belief was

justified. Unfortunately, when the vessel came to be tried on the measured mile, although she fulfilled her contract speed we were not satisfied with the efficiency. The superintendent at once said, 'You see, I told you so, it is the bilge keels that are doing it.' We therefore put the vessel in dry dock and cut off 20 ft. from each end of the bilge keels, tried the vessel again, when there was no appreciable difference. To thoroughly prove our case we put the vessel in dry dock again, took off the bilge keels altogether, when the difference was measurable, and as near as we could ascertain corresponded to our usual rule of skin friction only. As a matter of interest I may tell you that we discovered when we made screw experiments with the model that what was wrong was lack of surface in her propellers, and we made new propellers, when the efficiency result came up to what we expected. You may ask me, why did we not make screw experiments at first, the answer is because we had built an almost identical ship which had given proper results, and to this day I am not able to explain with certainty why the results were different, unless there was some curious effect in the stream lines due to the bossing or to the after lines combined with the draught of the ship.

"I have gone into great detail with this because I think it has a bearing upon what has been done in the way of experiments in screw propellers working right or left-handed. These stream lines have, in my opinion, a very great and generally unpredictable effect; and actual screw experiments must be made either with the model with shaft brackets, &c., or with the actual ship."

ABLE SEAMEN ON FOREIGN VESSELS.

New U.S. Instructions.

The following Departmental Circular has been issued by the American Bureau of Navigation and Steamboat-Inspection Service to collectors of customs, supervising and local inspectors, steamboat-inspection service, and others concerned:—

Section 13 of the Seamen's Act of March 4, 1915, will apply to all foreign vessels of 100 tons gross and upwards (except those navigating rivers exclusively and the smaller inland lakes and except fishing or whaling vessels or yachts) which depart from any port of the United States on or after March 4, 1916.

2. The section provides that 40 per cent. in the first year after that date, 45 per cent. in the second year, 50 per cent. in the third year, 55 per cent. in the fourth year, and thereafter 65 per cent. of the vessel's deck crew, exclusive of licensed officers and apprentices, shall be of a rating not less than able seaman.

3. An able seaman, to conform to the requirements of the section, must have the following qualifications:—

(*a*) He must be 19 years of age or upward.

(*b*) He must have had at least three years' service on deck at sea or on the Great Lakes on a vessel or vessels of 100 tons gross or upward, including decked fishing vessels (not including vessels navigating rivers exclusively and smaller inland lakes, and not including whaling vessels or yachts or fishing vessels, unless the fishing vessels are decked fishing vessels). Service on deck in foreign naval vessels or foreign vessels similar to vessels of the United States coast guard may be included.

(*c*) He must have been found competent upon examination as to eyesight, hearing and physical condition under rules prescribed by the Department of Commerce. This examination in the case of able seamen on foreign vessels may be conducted by the proper authorities of the country of which the seamen are citizens or subjects.

(*d*) Section 13 also provides for a special class of able seamen who may compose not more than one-fourth of the number of able seamen required on a vessel. Able seamen may qualify for this special class after having served on deck 12 months at sea or on the Great Lakes, but in addition to the examination mentioned in paragraph (*c*), they must have been found competent upon examination as to knowledge of the duties of seamanship under rules prescribed by the Department of Commerce. This examination in the case of able seamen on foreign vessels may be conducted by the proper authorities of the country of which the seamen are citizens or subjects.

4. Section 13 does not require that able seamen on foreign vessels shall be furnished with certificates as such. The section, however, does provide that a collector of Customs may, upon his own motion, and shall, upon the sworn information of any reputable citizen of the United States, setting forth that this section is not being complied with, cause a muster of the crew of any vessel to be made to determine the fact; and no clearance shall be given to any vessel failing to comply with the provisions of this section.

Accordingly, it may facilitate the despatch of foreign vessels from American ports if the necessary proportion of the deck crews are so certificated, thus preventing the delay necessary to ascertain by inquiry and examination whether in fact the necessary number of the deck crew are able seamen within the intent of the section.

5. Certificates issued to able seamen by competent authorities of the countries of which the seamen are citizens or subjects will be accepted by collectors of Customs as evidence that the able seamen so certificated comply with the requirements of Section 13 of the Seamen's Act. These certificates should certify that the able seaman is of the prescribed age, has had the prescribed sea service, and has passed the examination as to eyesight, hearing and physical condition, and, for the special class of short-term service men, has also passed the examination as to knowledge of the duties of seamanship.

6. This circular does not apply to able seamen on foreign vessels on the Great Lakes, who will be covered by another circular to be issued before the opening of navigation on the Great Lakes in the spring.

Asuncion.—The concession for the new works has been granted to American contractors working for an Anglo-American syndicate, and the contract between the Paraguayan Government and the concessionaires' representative was signed towards the end of October. The concession, which is for 99 years, gives the concessionaires the exclusive privilege of building, controlling and managing a port within a radius of 30 km. (about 19 miles) of Asuncion and of reclaiming a large area adjoining the capital. It is expected that the port construction will entail the expenditure of not more than £120,000, and that the work, which will be commenced by about March, 1916, will be completed 20 months later. Although details of the construction have not yet been decided upon, there will be a frontage of 500 to 600 metres (550 to 650 yards) along which a river-wall will probably be built. An alternative scheme is to construct a "talus" which will be fronted with a wooden platform. The present river-wall measures 288 metres (about 314 yards). The equipment will be thoroughly up to date, and electric power will be used for all purposes. Among the benefits which it is anticipated will accrue from these improvements, besides the initial benefit of the reduction of port charges from $3 (about 12s. at par) per metric ton to $2·50 (about 10s. at par) per metric ton and the more rapid loading and discharging of vessels, is that the shipping set free will cause freights to fall by at least 50 per cent. Furthermore, it is intended to establish a line of river steamers that will compete strongly with the company which until recently had a virtual monopoly of the river traffic. The largest steamers of this new line will have a draught of 8 ft., and will carry 700 to 800 tons of cargo and 30 to 40 passengers. In connection with this project it is proposed to form a transit company which will arrange through shipments to Paraguay by various companies engaged in the River Plate trade. Goods will be transhipped at Monte Video, where there will be a special pontoon, and forwarded thence by river steamer to Asuncion.

A NEW METHOD OF BENDING PLATES FOR ELIMINATING RIVETED JOINTS IN LIGHT STEEL-BOAT CONSTRUCTION.*

The cost of wood has in the past few years been going up by leaps and bounds, and wages have also increased. These augmentations in first cost of manufacture have added considerably to the cost of yachts, motor boats, and all other types of small craft. Running parallel with this has been the desire of the purchaser to buy as cheaply as possible. Besides the increased cost there is another objection to wood construction, due to climatic variations, which cause wood to warp and shrink. When a hull in which the planking has shrunk is launched there is leakage until the planks have absorbed enough water to cause them to swell sufficiently to tighten up the seams.

In the case of a motor boat, with a heavy engine on board, or a sailing yacht with a heavy keel or much ballast, there is grave risk of the vessel sinking unless someone is in constant attendance to keep down the water by pumping or baling. To those interested in the future development of the boat-building industry of this country, it has been for years a matter of some concern to discover a method of construction which would surmount some or all of these objections. Steel construction seems to be the solution of all troubles excepting that of labour.

Fig.1

Fig.2

As the supply of home-grown timber is very limited, and as it is extensively used for many important parts in the construction of boats, competition is very keen to obtain whatever comes on the market, consequently prices are kept at a very high level. So far as foreign timber is concerned the price is dependent on the supply available, freights and demand. Steel being produced in large quantities in this country as well as in many other countries the price is not likely to be affected in the same manner. Changes of climatic condition do not cause leakage, if one excepts corrosion, which may be provided against. It may be suggested that a steel boat is more liable to sink than a wooden one, but this very fact will cause precautions to be taken by providing buoyancy tanks, often neglected in wooden boats through the fact imprinted on the minds of all that wood floats. With the average wooden motor-boat the weight of the engine and fittings is such that, if the boat fills with water it is certain to sink, so that a steel boat fitted with buoyancy tanks is a safer proposition than a wooden boat as ordinarily built.

Considering the various methods of construction which may be employed in steel boats, these fall under two headings, seamless boats and all other methods of construction. Seamless boats are pressed out of one or two large steel plates. When two steel plates are employed, one is used for each side of the boat, and the two sides are riveted, or attached in some similar manner to the keel, stem and stern posts. This type of construction is fairly satisfactory so long as standard boats are built in quantities; but owing to the expense of making presses it is prohibitive to construct a single boat of a new type. Another objection is the straining of the plate which takes place at or about the bilge of the boat, and when large boats are built it is necessary to weld together two or more plates to obtain the necessary amount of material for the half girth amidships. This method of manufacture means considerable waste in cuttings as the girth towards the stem and stern is so much less than amidships. Heavy and expensive plant is necessary to work the plates for this construction, and, taking it all over, it has never attained the popularity which was anticipated when this system was introduced.

* Paper read by Mr. James Anderson before the Institution of Engineers and Shipbuilders, in Scotland on November 23.

The alternative methods are numerous. The first is that which is employed generally in steel construction—namely, riveting. In this type of construction it is usual to build each side in three or four strakes, for the ordinary size of pleasure boat up to about from 25 to 30 ft. in length, and the difficulty which is experienced in getting a fair boat when using these broad strakes is a serious factor against a cheap output. The rivets are not spaced very close together, and usually a strip of canvas is inserted between two adjoining strakes. There is, consequently, unless the work is carefully done, a chance of leakage, and subsequently corrosion at the joints. There is also a weakening of the structure through the rivet holes, or, if the plate is left sufficiently strong, and the rivets calculated out to be the weakest part, there is strength up to the shearing

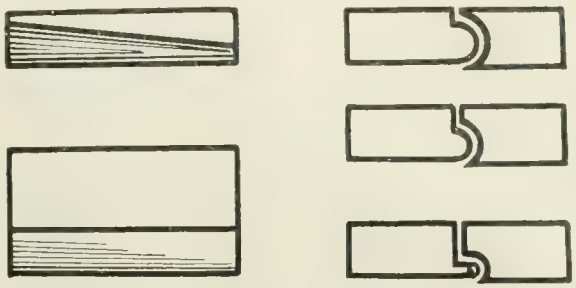


Fig 3

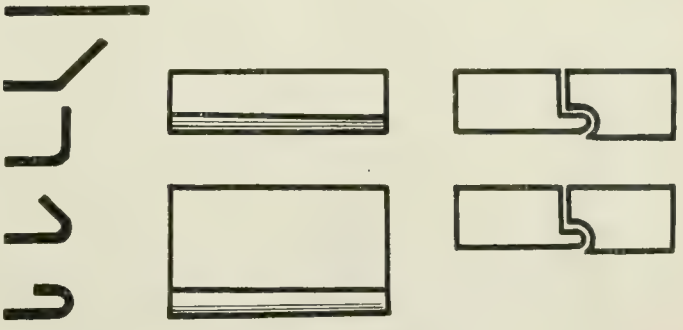


Fig.4 Fig.5

stress of the rivet area in each landing. The plates may be galvanised to avoid corrosion, but unless the completed boat is galvanised the rivet heads are exposed to corrosion, and if the rivets corrode away at the head a dangerous leak may be developed, either through the rivet hole or at the lap of the plates. Another method of joining the plates and other members together is welding. With welded plates the strakes may be made sufficiently narrow to work into a nice fair model, but when welded plates are galvanised before being built into the structure, the galvanising will burn off at the welding line. It is probable that the total weight of a small boat constructed entirely of steel would be considerably greater than one built of wood; but it would be possible when the shell is welded to the various frames, stringers, beams, &c., finally to galvanise the entire boat.

There is one other method in which the frames are bossed ou on the shell plates, and this method of construction has been successfully employed by a Clyde firm.

From the foregoing the following conditions would seem to be the ideal to strive after in light steel construction for boats:—Narrow strakes so that the boat may be built fair, that the joints should be riveted, that the riveting or attachment to the framework (as distinct from the shell riveting) should be of such a nature that it is protected from the action of the water. The method which the writer advocates has been in use in America for a considerable period, but the manner in which the end is attained is,

so far as can be ascertained, novel. Tinsmiths have a method of making a joint which they term a folded joint (Fig. 1). The plate is bent over on the edge like a hook. A second plate with its edge similarly hooked is interlaced with the first, and the two short legs of the hooks are pressed together, making an almost watertight joint (Fig. 2). For motor-boat construction the edges of the plates would be folded over in opposite directions like a pot hook, looking on the section of the plate. The tinsmiths' method is very simple and perfectly good for folding a plate with a straight edge; unfortunately the strakes of a boat are seldom straight; and most strakes vary in width, from a minimum at the bow and stern to a maximum somewhere amidships. Folding over a plate is similar to making what is known as a "single hem" on cloth, and it was trying to

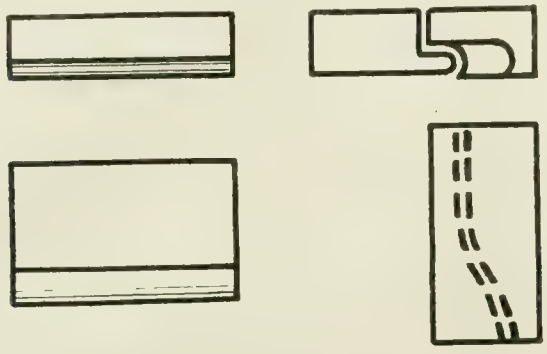


Fig 6

follow out the action of the fingers in this operation which led to the design of the dies employed for steel.

A considerable number of experiments have been made, and some interesting results obtained. The first idea was to cause the plate to curl round a semicircle between two dies, and then gradually narrow the semicircle until it took the form of a very flat U (Fig. 3). This form finally gave good results. As the die was rather long trouble was experienced when moving it along a curve, it being inclined to jamb and tear the plate. Sometimes the plate caught on the edge of the die, and the result again was tearing of the plate. These faults led the writer to think that, instead of bending the plate in a curve at the beginning, the best thing to do was to cause the plate to turn up in the path of a helix; but the power taken to drive this form of die was so great that it was abandoned (Fig. 4). New dies were then made, similar to the first set, but shorter, and the plate was started around a much smaller circle (Fig. 5). Further difficulties were encountered, and the results were so discouraging as to warrant the consideration of an entirely new form of die. Collecting the results of former experiments, and reviewing the difficulties that had been met with, it was thought that by opening the mouth of the female die, so that the plate just entered, and curving the passage in a semicircle, in section, at the same time making the passage curve inwards, in plan, then making the passage flatten down in section, an improvement in the result would be obtained. The male portion of the die was altered in section, having a practically flat plate at the bottom of the section. This combination fulfilled all that was desired (Fig. 6).

In this construction of boat it is proposed to make the framework of wood. The stem member will be of steel, V-shaped, with the opening looking aft in plan. The shell plating will be attached to the inside of the V, and along the inside of the keel. If necessary, there will be filling pieces fitted to make the section of the keel conform to the usual rectangular section of this member. An inside and outside gunwale will be fitted, bolted through the plating and the bent-wood timbers. On the top of this will be a capping piece. The timbers will be attached to the shell by means of small lugs which will be closed in with the shell plating, and have two sides in which the timbers will lie, having through fastenings in a fore and aft direction. By this method no fastening in the hull will be subject to the corrosion of water. The shell joints will be closed in, either by rollers or by means of cresses and hammers, or by first the one and then finished by the other. A coating of a good bitumastic solution and paint should render the steel of the shell absolutely impervious to the action of water.

VESSELS USING THE PANAMA CANAL.

The numbers of the vessels of various nations passing through the Canal each month, from the opening of the Canal to commercial traffic on August 15, 1914, to the date on which traffic was suspended by the action of the slides in Gaillard Cut, is shown in the following table. It will be noted that the British and American vessels preponderate greatly, forming, respectively, 43·7 per cent. and 39·7 per cent. of the total of 1,519 vessels. Together they comprise 83·4 per cent. of all the ships. Other comparisons are afforded by the table, in which classification by the nationalities is arranged alphabetically:—

Number of Vessels of Various Nationalities Passing Through the Panama Canal.

Atlantic to Pacific.

Month.	American.	British.	Chilean.	Danish.	Dutch.	French.	Honduran.	Italian.	Japanese.	Nicaraguan.	Norwegian.	Panamanian.	Peruvian.	Russian.	Swedish.	Total.
August ...	12	...	...	...	...	...	...	...	...	...	...	...	1	...	...	13
September...	13	13	...	...	1	...	...	...	...	...	...	...	...	...	...	27
October ...	15	27	...	1	...	...	...	...	...	...	1	...	...	...	...	44
November...	25	26	...	1	...	...	...	...	...	1	...	...	1	...	...	54
December ...	20	18	2	...	1	...	...	...	1	...	1	...	...	...	...	43
January ...	26	10	2	2	1	...	...	...	...	..	1	...	...	1	1	44
February ...	18	15	2	2	...	...	...	...	...	...	...	...	...	1	1	39
March ...	25	24	3	1	...	...	1	1	...	...	...	...	...	1	1	57
April ...	25	25	2	...	1	...	1	...	..	...	2	...	...	1	2	59
May ...	29	25	2	3	1	...	...	...	...	...	4	...	...	1	2	67
June ...	25	42	3	1	...	2	...	...	3	...	7	...	...	...	...	83
July... ...	33	41	2	3	1	...	...	...	6	...	2	...	2	...	3	93
August ...	23	42	4	1	3	...	...	1	2	...	6	1	3	...	...	89
September...	10	27	1	...	3	...	1	...	1	...	2	1	1	...	2	49
Total ...	299	335	23	15	12	2	3	2	13	1	26	5	8	5	12	761

Pacific to Atlantic.

Month.	American.	British.	Chilean.	Danish.	Dutch.	French.	Honduran.	Italian.	Japanese.	Niraguan.	Norwegian.	Panamanian.	Peruvian.	Russian.	Swedish.	Total.
August ...	9	...	...	2	...	...	...	...	...	...	...	...	...	...	...	11
September...	10	16	...	...	...	...	...	...	...	...	4	...	...	...	...	30
October ...	22	17	...	...	...	...	...	...	...	...	...	...	...	...	1	40
November...	19	16	...	1	...	...	...	...	...	1	...	...	...	...	1	38
December ...	23	31	3	...	...	...	...	...	...	...	...	...	...	...	...	57
January ...	20	23	2	2	1	...	...	...	...	...	4	1	...	...	1	54
February ...	21	25	3	2	...	...	...	..	...	...	2	...	...	...	...	53
March ...	33	29	4	4	...	1	...	...	...	...	5	...	...	...	3	80
April ...	22	27	2	...	...	...	...	...	1	...	4	1	1	...	2	60
May ...	31	31	2	2	...	...	...	1	...	...	5	...	...	1	3	75
June ...	28	24	3	...	1	...	1	...	1	...	1	...	1	...	...	60
July... ...	22	35	2	2	...	1	2	...	1	...	5	...	1	...	5	*77
August ...	29	34	3	1	...	...	...	...	...	...	2	...	2	...	1	72
September...	15	22	1	1	1	...	...	...	1	...	5	...	1	...	1	51
Total ...	304	330	25	20	3	2	3	1	4	1	37	2	6	1	18	*758
Grand total..	603	665	48	35	15	4	6	3	17	2	63	7	14	6	30	*1519

* Including one Argentinan vessel.

GENERAL NEWS SECTION.

PERSONAL.

Mr. J. G. Chrystal, of Thomas Thomson & Co., marine insurance brokers, Glasgow, has been appointed on the board of Nobel's Explosives Company, Ltd.

Mr. John Redmond Blood, of Malahide, has been elected a Commissioner of Irish Lights to fill the vacancy caused by the death of Commander Arthur G. Riall, R.N.

Mr. Wm. Young Hunter, Cardiff, retired master mariner, who died on October 11 last, left estate of the gross value of £2,521, of which £2,507 was net personalty.

Dr. William Melville Davison, of Overstrand, 13, Lancaster Road, Birkdale, Medical Superintendent of the Booth Steamship Company, left net personalty £921 and £1,046 gross.

Second-Lieut. E. D. Dickson, 9th Bn. Lincolnshire Regiment who was wounded at the Dardanelles recently, is a son of Mr. John Dickson, Chief of the Traffic Department of the Belfast Harbour Commissioners.

Mr. Albert Cope, one of the oldest pilots in the Bristol Channel, died recently. Mr. Cope, who was 75 years of age, retired some years ago. In 1871 he became coxswain of the Penarth Lifeboat and in his time took part in many rescues.

Among the names of those enrolled on the Commission of the Peace for the County Palatine of Lancaster last week was that of Col. Henry Concanon, T.D., a manager and Liverpool director of the White Star Line.

Mr. Charles Cunningham Scott, of Halkshill, Ayrshire, Chairman of Scotts' Shipbuilding and Engineering Company, Ltd., Greenock, who died on February 11, aged 47 years, has left personal property in the United Kingdom of the value of £137,360, of which £89,252 represents his share in the company.

Mr. John Gaff, of 53, Bothwell Street, Glasgow, and of Inchalloch, Row, and of 8, Lynedoch Place, Glasgow, late of John Gaff & Co., shipowners, of Glasgow, and formerly of J. and P. Hutchison, who died on December 6, 1914, left personal estate of the total value of £14,845.

Mr. W. H. Rogers, who is retiring from the position of Staithmaster to the Bute Docks Company, which he has held for 35 years, at the end of the year, was recently entertained to dinner by the executive officers and employees of the coal shipping and coal traffic departments of the Cardiff Railway Company. Mr. Rogers was made the recipient of an illuminated address and a valuable diamond pin "in recognition of the impartial kindliness and sympathy extended by him to one and all in the performance of his onerous duties."

Corporal Gerald H. Huston, Royal Engineers, who was accidentally killed in France recently after 16 months' campaigning, was an apprentice draughtsman at the Sirocco Engineering Works, Belfast, before he enlisted as a despatch rider. He was awarded the Distinguished Conduct medal for gallantry at Ypres in November, 1914, the official record stating that he carried messages under shell fire until his machine was destroyed by shrapnel. For his gallantry during the assault on Neuve Chapelle in March, 1915, he was presented with a special acknowledgment of thanks by his commanding officer. The son of a Belfast manufacturer, he was an ardent motorist, and knew no fear. He was home on leave three weeks before he met his death, which was due to a collision with a motor lorry. One of his brothers is an officer in the Canadian Engineers and the other is in the Motor Transport Corps.

SHIPPING DEBATE IN PARLIAMENT.

Mr. Balfour on the Transport Department.

On the motion for the adjournment in the House of Commons on December 23, several members raised questions dealing with the high freight rates and the methods of the Government in requisitioning ships. Mr. Hogge drew attention to the lack of proper transport facilities and Mr. H. Edwards said that the tinplate and steel trades of South Wales were in danger of being closed owing to the deficiency of the means of transport by land and sea.

Lack of Colliers.

In replying to the criticisms, Mr. Runciman, President of the Board of Trade, said that he wished it were possible to provide more tonnage to carry coal from South Wales. The trouble was that at present there were employed for purely naval and military purposes a fleet nearly three times the size of the whole German mercantile marine. This was conducting the whole of our supply services for us. On this our Army and Navy were dependent, and to a large extent the French and Italian also. This had greatly depleted the cargo-carrying capacity available for other purposes. At the same time there had been an enormous addition to the tonnage needed for the carriage of materials, metals and chemicals of various kinds, for munitions. The whole of that strain had to be borne by a merchant fleet less than that which was available in time of peace. The truth was that we had not sufficient merchant ships to go round, and a choice had to be made as to the trades which must do without a certain number of ships. All he could promise was that the Board of Trade would do all they could to induce vessels to take cargoes out rather than to go out in ballast in order to bring cargoes home. By withholding licences under the Order in Council of November a great deal of tonnage had been diverted to British trade and trade with the Dominions, which, of course, were placed upon the same footing as this country.

Subsequently, Mr. Peto raised the question of the requisitioning of ships for military and Admiralty requirements, and Mr. Goldstone urged that the Government should commandeer ships for the carriage of foodstuffs. Mr. Shirley Benn asked for a business committee of shipowners, and Mr. Denniss enlarged this scheme by the addition of shipbrokers.

Why Freights have Risen.

Mr. Balfour, replying to the points raised, said that the really governing proposition which everybody must keep in mind when they tried to deal with this subject was that freights had not risen because shipowners had been specially greedy, or because they tried unfairly to take advantage of public necessities and force up freights against the consumer. They had risen because the demand for freights had outrun the supply. It was the limitation of tonnage which was really the cause, and not the distribution of business among Government Departments. That observation had a bearing on the criticisms put forward by the hon. member for Sunderland (Mr. Goldstone) who pointed out to the House that if the Government had at the beginning of the war forbidden the transfer of tonnage from the British to neutral flags, the amount of available tonnage would have been greater than it is. He thought that was an error. Broadly speaking, one must deal with the mercantile tonnage of the world as a whole. It did the same work, whether it was carried under neutral or under the British flags, and might have an important bearing on many economic questions connected with this country.

The Transport Department.

The criticism made upon the Government, and especially upon the Admiralty, was that the Admiralty Transport Department first appropriated tonnage compulsorily and then misused it, or at all events failed to use it with proper economy. The further suggestion or criticism was made that if at the Transport Department there were shipowners of experience who could really control the matter, that waste of tonnage would be avoided. He thought there was a double fallacy in that contention. In the first place, they had at the Transport Department most valuable aid in the shape of shipowners of the highest possible standing and greatest practical

experience. They had worked with the Transport Department since February last in the closest touch and most absolute harmony, and he did not believe there was the smallest difference of opinion between these expert advisers and the head of the Transport Department as to the way in which the powers of this department could be used. The second was a much more fundamental error. It involved a complete misconception of what the Admiralty Transport Department did or legally could do. It was a department for obtaining for the Army and Navy, but primarily for the Army, the shipping necessary for the conveyance of troops and supplies. It had to take up colliers necessary for the efficiency of the fleet and to supply our ships abroad. Broadly speaking, the enormous strain thrown upon tonnage in this country during the war was done on behalf of the Army. All the Admiralty Transport Department had to do was to provide tonnage, and provide it as far as it could with fairness to the shipping trade and with as little inconvenience to those who were engaged in carrying on the shipping industry as might be. The inconvenience was very great. War conditions were inevitably more difficult than in peace.

ECONOMY AND CONTROL.

The responsibilities of the Department were heavy, but what was not thrown upon it was the responsibility for seeing that the tonnage was used in the most economical fashion possible. They had no control over that. The Director of Transports was perpetually urging upon those who used the tonnage that it should be utilised economically and that transports should be unloaded with speed and returned as soon as possible. It was the Army and the Admiralty, regarded as fighting Departments, which requisitioned. It was the Army and Navy that managed the loading and unloading of transports at home and abroad. It was not fair or just to throw upon a department which had no power to deal with this question any responsibility for such wastage as might have occurred.

It was the Admiralty as a whole that was responsible, and the official who by immemorial tradition ought to be abused for anything thought to be wrong was the controlling head of the department. Dr. Macnamara and himself were the persons to abuse. That was one of the things that one was paid for.

MILITARY NECESSITIES.

It entirely missed the point to say that the Transport Department was responsible for such waste of tonnage as might occur in meeting the needs of the Army, for the department has nothing to do with it. One might ask who was ? These were transports ordered by the Army for carrying soldiers, military stores, and to do for the Allies that which an enormous and intricate system of railways did for the Central Powers of Europe. It was upon the British fleet primarily and the British merchant shipping fleet in the second place, that the whole responsibility for carrying on the war at the present moment rested. He did not say this to minimise the share of the burden taken by our Allies in the Mediterranean and elsewhere, but on the seas of the world our communications depended on the British naval and mercantile fleets. It was the military line of communication between this country and the Continent, and that consideration must control the question of tonnage.

When one was dealing with soldiers and sailors engaged in difficult military operations it was they who must control the means of communication. If a transport went into Mudros Harbour and stayed there an undue time according to any ordinary commercial standard, how were they going to put that right by having at Whitehall a body of the most expert shipping experts in the world ? They might say, " You are keeping a ship of 5,000 tons too long " ; they might say, " You are keeping a ship in one place in order to get at the cargo at the bottom, and that is not an economical way of proceeding." The reply of the military authorities might be that they wanted the goods, even at the top of the cargo, and that they could not find a convenient place for storing them and could not allow them to be taken away.

"A WASTE OF TONNAGE."

There had been a waste of tonnage. If they had had an angel from heaven to manage the tonnage they would not be able to carry on war work with the freedom with which they could carry on work at Liverpool or Hull. Let them take Mudros. It was a great natural harbour, so large that anything like a strong wind would make it impossible to use lighters safely, and it had not the appliances for the speedy loading and unloading of vessels. In control of the harbour they must have military and naval authorities who were wholly untrained in the ordinary commercial work of ships. If a shipowner was not economical of tonnage he went bankrupt, but the business of an admiral was not to save tonnage, but to win battles. To that condition everything was secondary.

The Department of the Admiralty was not responsible for the fact that a particular transport was kept three weeks when she might perhaps have been kept only for a week. The result was very serious, but it was not the fault of the Admiralty or the Board of Trade, and he had not yet discovered a thoroughly satisfactory method of dealing with it. Something was being done, however, but it could only be done through the people responsible for the military operations. If a general said, " I am very sorry that this or that ship should be detained, but detained she must be in the military interests of the expedition," what was he to say ? What was the Secretary for War or the Transport Department, or the Board of Trade to say ? They could not say anything except, " Please be as economical with the tonnage as you can, because it is of national importance that as much as possible should be available for the general purposes of the country."

If anyone could suggest a method of dealing with the situation which got over the difficulty he would be most happy to consider it. All that could be done was to press upon those who had to conduct these military operations the extreme desirability of saving the tonnage in the general interests.

STATE CONTROL.

The member for Sunderland (Mr. Goldstone) wanted the whole of the merchant shipping to be taken over by a department of the Government. He thought there were objections. There were some necessities of the Munitions Department which, left to supply and demand, freightage would be so dear that one would hardly get any articles at all. Therefore they could not say there should be no Government interference with shipping. On the other hand, the rival scheme was open to considerable objection. It was a tremendous affair to take over the whole mercantile marine, and it would be a task with which the department he was connected with would have nothing to do. It could only be done by the Board of Trade or some committee connected with that department. He did not at all assert that they should reject as absolutely impossible the proposal of becoming practically for the time being the owners of the entire merchant fleet, but he did say the difficulties were far more complicated than most members thought.

STIMULATING SHIPBUILDING.

One of the ways of mitigating it was to encourage an industry which had really practically almost ceased since the beginning of the war—namely, the building of merchant vessels. A clause was put in the Munitions Bill which would enable them to say that that was carried on as war work, and war work he believed it was. Therefore he hoped that the House would without delay let that Bill through. Every day that passed delayed the completion of a merchant ship. By delaying the completion of a merchant ship it diminished the amount of our possible tonnage. By diminishing the amount of our possible tonnage it maintained freights at their present terrible level, and by keeping freights at the present level it certainly increased the price both of necessities of life to the poor and many things which were necessary to the Government in the proper conduct of this war.

PORT NOTES.

Madras.—The Madras Government has made grants for the year 1915-16 for the construction of a new sea wall and pier at Tellicherry, a new pier at Kulasekharapatnam, improvements to the port of Vizagapatam, two new piers at Calicut, a new landing stage at Mangalore, and a dry dock at Tuticorin.

Port Dues at Salvador Ports.—Mr. E. P. Lawlor, Salvador Consul at Newport (Mon.), has written to the Newport Chamber of Commerce advising them that the Government of Salvador had decreed that no port dues (fiscal) or charges of any other class would be made on steamers calling at any of the ports of Salvador, whether the navigation companies were or were not contractors to the Government.

Posadas.—The *Boletin Oficial* (Buenos Ayres) of November 2 publishes a Decree approving the tariff of charges for facilities accorded to vessels at the port of Posadas. The tariff includes wharfage dues, charges for the unloading of merchandise and animals, and warehouse fees. The above-mentioned issue of the *Boletin* may be consulted by United Kingdom shippers and shipowners at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

FROM OUR CORRESPONDENTS.

CLYDE AND DISTRICT.

(From Our Own Correspondent.)

Glasgow.

The holidays in the shipbuilding and other industries on the Clyde begin to-morrow (Friday) afternoon, and work will be resumed not later than Wednesday of next week. On account of the national interests at stake the authorities recommend that the holidays this year be curtailed as much as possible in all the shipyards, engineering shops, and munition works in the Clyde district. It has too frequently been the case in the past that after a holiday period one or more days have been lost owing to the workmen not putting in an appearance at yards on the day appointed for the resumption of work.

It is doubtful, however, if the steel workers will fall in with the recommendation of the authorities to resume work next week. In some cases, at least, they will not be asked to do so, owing to the necessity for carrying out repairs to plant, &c. Since the last stoppage for holidays in July practically every steel-making establishment has been running at higher pressure than has ever been experienced hitherto, and the repairs will, therefore, be correspondingly heavy. Work will probably not be fully resumed till January 10. The great bulk of the output of steel is for Government account, but there is also a fair amount of mercantile shipbuilding material being turned out. The imports of steel from abroad during November shows a falling-off as compared with previous months. There were landed at Scottish ports last month a total of 4,957 tons of steel, valued at £58,741, from the United States; 10 tons, valued at £117, from Canada; and 106 tons, valued at £1,688, from the Continent. Of the imports from the United States, 1,994 tons consisted of plates, and 1,506 tons of bars and angles.

Shipyard Extension at Grangemouth.

Arrangements are being made by the Greenock and Grangemouth Dockyard Company for the extension of their shipyard at Grangemouth. The firm have acquired from the Town Council of Grangemouth a piece of ground with a number of buildings thereon. The greater part of the new ground will be utilised for shipbuilding purposes. The Greenock and Grangemouth Company have on hand at present a goodly number of vessels, some of which are of the oil-tank type. It was reported some time ago that they had booked an order for six cargo steamers for J. &. J. Denholm of Greenock. These vessels will be of 1,980 tons each, or about 550 tons larger than the majority of this firm's existing fleet. It is understood that all the six will be built in the Grangemouth yard.

Shipbuilding at Leith.

The shipbuilding output of Leith for the year which is now drawing to a close is considerably under that of former years. Shipbuilders have, however, been fully employed, not only on new work, but also on repairs, a large amount of which has been carried out at the port during the year. With seven dry docks, large and small, at the disposal of the various firms, Leith is admirably equipped for the work of ship-repairing, and especially in dealing with small or moderate-sized craft. The latest new vessel to be completed at Leith is the tug *A. M. Stewart*, which has been built by John Cran & Co., for the Canadian Stewart Company, Toronto. The tug, which ran satisfactory trials on the Firth of Forth last week, is 110 ft. in length. She has been fitted by the builders with compound surface condensing engines of 900 i.h.p. Messrs. Cran have built two other tugs during the year, each of 214 tons gross, for Liverpool owners.

THE NORTH-EAST COAST.

(From Our Own Correspondent.)

Newcastle-on-Tyne.

The holidays have been on a restricted scale, compared with peace times, for at the affiliated shipyards and engineering establishments they are to be confined to Christmas Day and December 27, and New Year's Day and January 3. The amount of Government tonnage in hand is certainly of less volume than 12 months ago, and there is a little improvement in the prospect for further progress being made with commercial work early in the New Year. Several of the leading builders have been approaching the Admiralty, the Board of Trade, and also the Ministry of Munitions, in order to effect some arrangement with the steel manufacturers to allocate delivery dates for turning out steel sections. There are considerable arrears of commercial work, and relief can only come through improved deliveries of all classes of material. All classes of shipbuilding material keeps very firm in price and the mills are working at considerable pressure. Iron ship plates are £11, iron ship angles, £13; iron ship rivets, £15; steel ship plates, £11; steel ship angles, £10 15s.; and steel boiler plates, £13 per ton. Prompted by the joiners and others engaged in the furnishing branch, there is yet another demand for further increases in wages. The piece workers, such as platers and riveters are not concerned in this demand, and the engineers will be required to continue at their existing rates until the expiration on June 30 next of their present agreement. As the time workers secured an advance of no less than 4s. per week in the early part of the year this second demand within 12 months has come somewhat as a surprise.

Evidence of labour shortage is to be seen on all hands, for at several yards mercantile vessels are standing on the ways bolted together, but without a rivet in them. The scarcity of riveters is nothing short of acute, and with the continuance of the existing higher scale of payment for war work little real improvement may be looked forward until some concerted attempt is made by the authorities to divert the riveters to mercantile tonnage ordered long ago and now much overdue. Enquiries for new commercial vessels are in prolific circulation, but there is no prospect of any orders being accepted for delivery for many months ahead.

Shipyard Extensions on the Tyne.

Sir W. G. Armstrong, Whitworth & Co., Ltd., are to construct a new timber quay with a river frontage of 400 ft. and a width of 12 ft. 9 in., on the north bank of the Tyne, at Newburn Haugh. Another quay, with a 70-ft. frontage to the river is also being built for the Elswick firm at the Blaydon Main Staith, Derwenthaugh. Swan, Hunter & Wigham Richardson, Ltd., will shortly begin with the reconstruction and strengthening of their quay at the Neptune Shipyard, Walker. Palmers Shipbuilding & Iron Co., Ltd., have a project for building a new wharf at the east end of the Jarrow shipyard, which is to have a 500-ft. frontage to the river and will be carried upon timber piles and occupy a portion of the site now taken up by the existing timber wharf, east slipway, jetty and gangway. This work has been called for by the need for further facilities for the fitting out and completion of the larger types of vessels now being dealt with at the Jarrow establishment.

MERSEY SHIPPING AND SHIPBUILDING.

(From Our Own Correspondent.)

Liverpool.

The Liverpool to Maryport and Whitehaven service of Tedcastle, McCormick & Co., Ltd., has been purchased by John Pattinson & Son, Ltd., and the transfer will take place at the end of this week, together with the steamer *Cumbria*, which has, up to now, maintained the service. The *Cumbria* made her last sailing under Tedcastle, McCormick & Co.'s direction on Wednesday this week. The Beacon Line (John Pattinson & Son, Ltd.) will, therefore, work these two services to Whitehaven in combination, with such additional sailings as may be required.

For some days it has been rumoured that Furness, Withy & Co. had concluded an important purchase of three steamers, namely, the *Kilkerran*, the *Kilchattan*, and *Kilbride*, belonging to Connell Bros., Ltd., of Glasgow, and I have been able to learn that this deal, negotiated by Liverpool shipbrokers, is practically completed. The price paid, I learn, is £90,000 each for the *Kilkerran* and *Kilchattan*, and £61,000 for the *Kilbride*. The two former are single-deck steamers of 2,418 tons register each, built in 1906 by C. Connell & Co., Ltd., Glasgow, and the *Kilbride*, built in 1901, by the same firm, has two decks. The two sister ships, *Kilkerran* and *Kilchattan*, are 361 ft. 8 in. long, 47 ft. 6 in. beam, and 29 ft. deep moulded, and the *Kilbride*, 354 ft. 1 in. long, 45 ft. beam, and 28 ft. 6 in. deep moulded.

Notwithstanding rising freights in the principal commodities imported into Liverpool, such as wheat, cotton, timber, &c., it is becoming extremely difficult to get steamers to deal with cargo that is in sight, and the position will become worse as a result of tonnage requisitioned, and the sustained demand for ships on time charter. Cotton imports hitherto held back, owing to the preference given to grain shipments now finds the market bare of tonnage, and this state of things is causing some concern on the Cotton Exchange here.

Excepting where vessels have been already booked, it is next to impossible to obtain vessels to carry cotton in the immediate future.

Cammell Laird & Co. continue to have trouble with their workmen for slacking and losing time, and a number of these were fined for these offences by the Munitions Court on Thursday. A feature of this last batch of offenders is that a number of them are addicted to card-playing during working hours, and whilst being paid double wages for urgent work.

There is continued firmness in the coal market here owing to short supplies, and the stoppage of work at the collieries during the holidays will, it is expected, make matters still worse. Prices have gone up roughly about 1s. a ton, and are around 22s. to 23s. for Lancashire qualities, while Yorkshire hards are very firm at 26s., both f.o.b. Liverpool. The Birkenhead rate for North Wales qualities is 23s. 6d., with very little obtainable.

A notice to mariners issued by Rear-Admiral Stileman, Senior Naval Officer at this port, sets forth that a portion of the River Mersey has been reserved as an anchorage area for His Majesty's ships and merchant vessels operating under Admiralty directions. This area lies opposite Egremont, and extends on the Liverpool side from the north entrance to the Sandon Half Tide to the Hydraulic Tower on the south side of Canada Basin.

Very heavy shipments of Egyptian cotton have lately been made to the eastern seaboard of North America in consequence, so it is said, of the new regulation of the United States, which will come into force in February, requiring all Egyptian cotton to be disinfected on landing there.

SOUTH WALES NOTES.

(From Our Own Correspondent.)

Cardiff.

The best means of increasing the revenue of the harbour, owing to the finances of the Trust having been depleted through the war, was under consideration at a meeting of the Swansea Harbour Trust on Thursday last, when it was decided (1) to increase the harbour and dock rates on coal, coke and patent fuel from 2d. to 2¾d. per ton; (2) to increase the consolidated rates on goods by 1 per cent., making with the increase made on April 9 last 20 per cent.; (3) and to increase the dock rates on all goods, wares and merchandise (other than coal, coke and patent fuel) shipped or unshipped, and not dealt with by the Trust under the consolidated rates, equal to 20 per cent. on the existing combined harbour and dock rates. The increases are to take effect as and from January 1, 1916, and are only temporary—*i.e.*, for the duration of the war and perhaps six months afterwards. The trustees of the Swansea Harbour have deposited a Bill authorising them to postpone the repayment of the short-term mortgages which fall due on January 1 and July 1 in each year. The reason for this is that the trade of the port has been adversely affected by the war, and the trustees are, for the time being, unable to borrow the money necessary to pay certain short-term mortgages as they fall due. They propose that every mortgage which falls due between June 30, 1916, and January 2, 1919, shall be construed as if the date of redemption had been July 1, 1919, upon the condition that from the date on which the principal fell due the interest payable on such mortgages shall be raised to 5 per cent. per annum.

Welsh Steelworks Deal.

The Briton Ferry Steel Company, Ltd., has purchased the works of the Baglan Engineering Company, Ltd., Briton Ferry, which will be taken over in the New Year. Only about six months ago the Albion Steel Works, Briton Ferry, was taken over by the Briton Ferry Steel Company, Ltd., of which Mr. Herbert Eccles, J.P., is the managing director. The Baglan Engineering Works were erected about 20 years ago and have been in continuous operation ever since.

November Dry-Dockings.

A fair amount of activity characterised the Welsh ship-repairing industry during November. Altogether 187 vessels of 477,169 tons gross register were dry-docked, against 180 of 475,788 tons in November of 1914, an increase of seven vessels of 1,381 tons. Details for each port are :—

	November, 1914.		November, 1915.	
Port.	Vessels.	Gross Tons.	Vessels.	Gross Tons.
Cardiff... ...	100	281,161	85	212,564
Swansea	8	15,485	18	25,975
Newport	21	54,610	29	72,322
Barry	47	114,306	47	148,303
Port Talbot	4	10,226	8	18,005
Totals ...	180	475,788	187	477,169

THE FREIGHT MARKETS.

(From Our Own Correspondents.)

London.

It is hardly to be expected that the usual freight market activity will prevail before the New Year is in, but there is, on the other hand, no likelihood of a fall in rates. Also no one anticipates any improvement in the supply of prompt tonnage. On the whole the demand for boats is good. Firmness characterises the Plate section and 122s. 6d. can be had by handy boats for up-river loading places to the United Kingdom. For slightly bigger boats the rate is about half-a-crown less. A 4,400-ton, 10 per cent. boat has been taken up for February at 118s., Buenos Ayres or Lacato to the United Kingdom, not north of the Thames. Bahia Blanca to the United Kingdom has been closed at 120s., February–March, to the *Burnholme*, 5,500 tons, 10 per cent. American coal business is represented by Virginia to the Plate at 52s. 6d. To West Italy this coal business is worth about 90s. From the Northern Range tonnage has been taken up at 17s. 6d. to French Atlantic port, January 10–February 5. The rates to the United Kingdom are 13s. 6d. Bristol Channel, 3d. extra other West Coast ports and 6d. extra per quarter to London–Tyne range. Business on this basis has been done by the *Tunstall*, 30,000 quarters, 10 per cent., February 20 cancelling. It is generally considered that Australian charterers would have to show some advance in their rates if they wish to secure tonnage. In the Gulf section steamers for grain loading can be had at 23s. West Italy and 15s. United Kingdom. The *Berwindmoor*, 32,000 quarters, 10 per cent., has been taken up at 14s. 9d. to the Bristol Channel, option London at 15s. 3d. Ore from Spain to the United Kingdom offers 23s. to 25s., according to loading port, whilst phosphate from Sfax to Bay ports bids 42 fr. In the outward coal market fixtures from the Tyne include :—St. Nazaire, 30s.; Rouen, 21s.; Calais, 30s.; Rouen, for coke, 30s.; Cardiff reports that the market is inclined to be firmer. Cadiz has been done at 36s., Santander at 25s., Rouen at 20s., and Marseilles at 73 fr. Liverpool to Alexandria has paid 67s. 6d. to the *Moeris* for a consignment of coal. Newport to Rouen has closed the *Aline Montreuil* at 22s.

Glasgow.

Business on the Glasgow market has been interrupted to some extent by the Christmas holidays. Towards the close of last week a firm tone prevailed in most trades, but there was a disposition to allow negotiations to stand over till after the holidays. The coal trade from Scottish ports is still taking up a good deal of tonnage and exports from the Lanarkshire fields is fairly heavy in spite of the great demand which exists for coal in the local steel and other industries. Among the fixtures reported were :—Glasgow to Genoa, Savona or Leghorn, 4,500 tons, 64s., guaranteed terms, December; Ardrossan to Bordeaux, 1,950 tons, 44 fr., early January; Glasgow to Bordeaux, 2,800 tons, 45 fr., December-January; Glasgow to Bayonne, 2,300 tons, 46 fr., early January. In homeward markets a holiday feeling prevailed, but any fixtures made were at full rates. America was quiet at 13s. 6d., Bristol Channel; 14s., Glasgow, and 16s. 6d., French Atlantic ports for grain. The homeward Plate market paid 120s., for January-February loading. Eastern markets continued to move upwards, and Madras Coast to Marseilles was done at 142s. 6d. net. Bombay reported 111s. 3d. done for the United Kingdom. Calcutta quoted fully 130s. and Burmah was on a similar level.

Newcastle-on-Tyne.

Great congestion of loading turns has rendered chartering very difficult during the past week, and the volume of business completed, therefore, is small. The absolute stagnation of the prompt coal trade, too has had its effect, and although tonnage is still very scarce, shippers have been able to cover their needs, in the nearer trades at least, at appreciably lower figures. No fixtures are reported in the coasting trade, but quotations rule on the easier basis of 15s. to London. A fair amount of business has been transacted for North France, but Rouen has fallen to the level of 20s., and rates are from 3s. to 3s. 6d. down on the week. Little has been done Baywards, and a reduction of 2s. 6d. has had to be accepted for Bordeaux, whilst St. Nazaire is down to 30s. The Mediterranean continues to be very firm, and Genoa has been fixed for at figures slightly higher than those which obtained a week ago, whilst Algiers has again paid 40s., and Oran 41s. The Islands are weaker at 35s. to Las Palmas. Fixtures arranged since last report include the following :—Algiers, 2,600, 40s.; Bordeaux, 1,500, 31s.; Calais, 1,000, 23s.; 500, 30s., coke; Carthagena, 900, 60s., coke; Dunkirk,

2,000, 22s.; 600, 28s., coke; Genoa, 2,500, 66s. 6d.; 2,500, 67s. 6d., d.w.; Girgenti, 2,200, 62s. 6d.; Las Palmas, 3,000, 35s.; Marseilles, 4,000, 50s.; Oran, 2,600, 40s.; Palermo, 2,000, 62s. 6d.; Rouen, 1,800, 22s.; 2,000, 21s.; 700, 30s., coke; 1,800, 20s.; St. Nazaire, 2,500, 30s.; Savona, 5,200, 66s. 6d.; Toulon, 1,600, 52s. 6d.; Trouville, 600, 21s.

Liverpool.

The holidays produced a quiet effect on this market, but with the exception of a slightly easier tone for some outward engagements, freights generally have been maintained and continue quite steady. Time charter engagements have been entered into at very firm rates, four round trips United States to West Italy paying 28s., and 12 months done at 25s. in respect of three steamers in the European trades. Twelve months' time rates are now quoted at 30s. for good class boats, and 20s. for two years. In the homeward trades, River Plate is a strong market at 120s. San Lorenzo to United Kingdom for January-February, and one fixture being for March 25 cancelling. North America quiet, but very firm, Range still paying 13s. 6d. to Bristol Channel, and 17s. 6d. to French Atlantic. Heavy grain, Gulf to United Kingdom paid 15s. January; to Barcelona, 23s. and 23s. 6d. offering to West Italy. Eastern markets are needing tonnage, and are offering higher rates. Bombay has paid up to 113s. on deadweight to United Kingdom, and 97s. 3d. scale to Dunkirk, while 100s. scale is offering from Karachi. Representative values from Madras are 155s. less 5 per cent. to Marseilles; and 120s. from Vladivostock to United Kingdom, latter offering March-April. Mediterranean rates are still going higher, and 45s. has been paid Alexandria to Liverpool. Australia quiet at the 95s. rate, and unattractive. North Pacific and nitrate ports very firm, but nothing doing. Sail freights are still dull outwards, but very firm homewards in all directions. North Pacific offering higher rates to attract ships.

Cardiff and Swansea.

Usual holiday conditions have pervaded the freight markets. Merchants having in most cases covered their immediate requirements the demand was not of a pressing character, and rates generally developed easiness on account of stemming difficulties. Despite this, owners with suitable vessels were able to obtain top freights. Mediterranean operations were confined within narrow limits, and rates for prompt boats were upheld but for after the holidays they were on the easy side. Algiers was done at 65 fr.; Alexandria, 71s. 6d. (500 tons delivery—a new high record) and 67s. 6d. (700 tons delivery); Bagnoli, 61s.; Genoa with options, 66s. (a new record); Gibraltar, 32s. 6d. (three); Lisbon, 31s. 6d. (400 tons delivery); Marseilles, 73 fr. (twice); Port Said, 70s. (a new record) and 68s. 9d.; Porto Ferraio, 60s.; Savona-Spezia-Leghorn or Naples, 66s. (500 tons delivery—a new record); and Tunis, 80 fr. Bay and coast chartering was slow, with rates distinctly weaker owing to a limited demand and the difficulty experienced in stemming. Bordeaux was done at 40 fr.; London, 14s. and 14s. 6d.; Rouen, 22s. (twice), 21s., 21s. 6d. and 20s.; Santander, 25s.; St. Malo, 18s. 6d.; and St. Nazaire, 35 fr. The South American market was quiet but steady, River Plate fixing at 40s. (twice) and Rosario at 41s. A sailing vessel of 1,250 tons was fixed for Lisbon at 27s. 6d. Chartering from Swansea and Port Talbot was also slow, with rates on the easy side, Algiers fixing at 65 fr. and 64 fr.; Bordeaux, 40 fr.; Calais, 22s. 6d.; Dunkirk, 24s.; Dieppe, 21s.; Nantes, 36 fr.; Rouen, 22s. (six) and 21s.; and St. Brieux, 23s.

Hull.

The tone of the Mediterranean market is firm, with a good inquiry and rates fully maintained at 65s. for Genoa or Savona from Hull, and 67s. 6d. to 70s. for Alexandria from Hull. In the River Plate direction there is very little business doing, but rates are based on about 40s. for Buenos Ayres from Hull. In the coasting branch the War Trade Department is continuing to refuse in numerous instances business for cargoes of coal to the North French ports, and this has brought rates down to 22s. for Rouen from Hull for early January loading and 21s. 6d. to 22s. for Dieppe from Hull. The coastwise trade to English coasting ports is quiet at the moment owing to the difficulty of getting supplies of fuel for shipment.

THE OVERDUE MARKET.

This list contains vessels overdue or on which extra rates are considered necessary.

	Gns.
Invermark (s.v.). Fremantle, July 17, to Iquiqui	92
Llandaff (s.v.). Port Arthur, Texas, August 13, to the United Kingdom	92
King Eduard (s.v.). Sabine to River Plate; lifeboat picked up...	92
Tellus. Ashore Nemuro	80

THE COAL MARKETS.

(From Our Own Correspondent.)

Practically speaking, business on the coal markets has been at a standstill owing to the intervention of the Christmas holidays. Nor is it to be expected that normal conditions will prevail again until the New Year is here. From the Tyne it is reported that, in addition to the dislocation of business arising out of the holidays, there has been further trouble owing to scarcity of coal. Apparently there is little likelihood of large supplies coming on the market until the steamers which are waiting to load have secured their shipments and left. It is this lack of supplies which has operated to put a check on business for January loading.

Prices for North Country coal have been advancing, and at the opening of the present week values were strong, and the market opened with a strong tone. Where coal was obtainable the prices quoted were readily agreed to. D.C.B. steams stood at 22s. to 22s. 6d., Tyne prime steams at 21s., with seconds at 18s. 6d. to 19s. Smalls ranged at 11s. for D.C.B. and 13s. 3d. for Tyne primes. Ordinary bunkers fetched 21s., bests 22s. to 23s., and specials 25s.

The same holiday influence has been a feature of the Cardiff market, no business being transacted during the past week-end. As a matter of fact, Cardiff showed indications of a strong holiday feeling a couple of days before Christmas. Despite this, however, the market was undoubtedly firm for large coals, and such inquiry as came on the market was in regard to vessels to load immediately after Christmas. Owing to the restricted production there was a movement on the part of sellers not to commit themselves any further for December. Less activity was in evidence for January, buyers showing a tendency to hold off business until the resumption of more normal conditions after Christmas. There does not seem to be any indication that the collieries intend to lower their figures for January loading. Approximate quotations are:—Second Cardiff large coal, 24s. 6d. to 25s. 6d.; ordinary large steam, 23s. 6d. to 24s.; best drys, 25s. to 26s. 6d.; ordinary drys, 23s. 6d. to 24s.; and best Monmouthshire Black Veins, 24s. to 25s. 6d.

It may be noted that during last week a good number of vessels carrying small consignments of pit-wood, arrived at Cardiff. The Newport market closed before Christmas with a strong tone, and there was a tendency toward a hardening of values. The supplies of pit-wood at Newport had fallen behind the demand and prices were consequently maintained on a high level.

There has been some falling-off in Scottish export business. For home consumption the demand was very strong, with the result that the coal for shipment was in very small quantities. There is no doubt that colliery proprietors are fully alive to the advantage of catering for the home trade. This being so it is not surprising that there has been some falling-off in the demand for tonnage, although this has not had any pronounced effect upon freight rates. Just prior to Christmas the business of coal loading at the docks was being carried through somewhat slowly. There was some measure of congestion owing to the number of vessels in port and also partly by reason of delays on the part of the railways and a dearth of wagons. Both at the ports on the east and west coasts very similar conditions prevailed. Values for West of Scotland coals, approximately, were:—Best ell, 21s. 6d. to 22s.; ordinary ell, 20s. 6d. to 21s.; best Splint, 24s. to 26s.; ordinary Splint, 21s. to 23s.; Navigations, 23s. 6d. to 24s. 6d.; steams, 17s. to 20s. For Fifeshire sorts representative quotations were:—Screened Navigations, 24s. to 25s.; unscreened Navigations, 22s. to 23s.; first-class steam, 21s. to 22s.; third-class steam, 15s. to 15s. 6d. In the Lothian section values were nominally as follows:—Best steams, 19s. to 21s.; ordinary steams, 18s. 6d. to 19s.

A meeting of traders has been held at Sheffield Coal Exchange, at which a resolution was passed recording with the deepest concern the proposal to pool all private traders' railway wagons. The meeting further expressed the opinion that any attempt to interfere with the statutory rights of traders to supply their own rolling-stock would render it impossible for them to secure and maintain adequate supplies during the crisis.

Replying to a question in the House of Commons on this same subject, Mr. Runciman said that the Board of Trade and the Railway Executive Committee were giving their consideration to the suggested pooling of railway wagons. There were great difficulties in the way of such a scheme, and the interests of wagon companies and other private owners would be carefully considered.

Answering a question put by Mr. Perkins, Mr. Runciman stated

that the value of coal, coke and manufactured fuel registered as exports to neutral countries during November amounted to £1,109,742, or nearly 36 per cent. of the value of the total exports to all destinations.

COMPANY REPORTS AND DIVIDENDS.

Dulcia Steam Shipping Company, Ltd.—An interim dividend of 2s. 6d. per £1 share.

Whitefield Steamship Company, Ltd.—Interim dividend for the half-year ended November 30, at the rate of 20 per cent. per annum, free of income-tax.

Stoomboot Maatschappij Hillegersberg (Amsterdam).—By declaring an interim dividend of 40 per cent. this company provides yet another instance of the favourable effect of the war on Dutch shipping.

Branksome Chine Steamship Company, Ltd.—H. G. Harper & Co., London and Cardiff, managers, have declared a final dividend of 10 per cent. for the year ended November 30, making 20 per cent. for the year.

Canford Chine Steamship Company, Ltd.—H. G. Harper & Co., London and Cardiff, managers, have declared a final dividend of 10 per cent. for the year ended November 30, making 20 per cent. for the year.

Tilbury Contracting and Dredging Company, Ltd.—The directors recommend a dividend of 3 per cent. for the year, placing £2,500 to reserve, £11,523 to depreciation reserve, making £107,404 and carrying £4,184 forward.

Red "R" Steamship Company, Ltd.—The report states that the balance is £32,146, after making provision for taxation and possible calls by the War Risks Association. The directors propose to pay a final dividend of 20s. on the ordinary share, which, together with the preference dividend, £519, paid in November, will leave £21,234 to be carried forward.

Snowdon Steamship Company, Ltd.—Charles Radcliffe & Co., Cardiff, managers, in their report for the year ended November 12, state that in addition to wiping off the adverse balance of £2,361, also the balance of £4,435 on survey account, and the sum of £317 for repairs, the company is able to pay a dividend of 5 per cent. and carry forward the balance of £194.

Scarisbrick Steamship Company, Ltd.—The accounts for the period ended December 10 show a net profit of £18,250. The directors recommend a final dividend of 10 per cent., making 20 per cent., free of income-tax, for the period from December 17, 1914, to December 10, 1915. They propose to write off the book value of ss. *Daybreak* £4,750, and to reserve for income-tax and war tax £4,400, carrying forward £33.

Thomas & Appleton Shipping Company, Ltd.—The accounts for voyages 8, 9, 10 and 11 show a profit of £34,182. An interim dividend of £3 per £10 share has already been paid, and another £1 per share is to be divided, free of income-tax, making 40 per cent. for the period covered by the accounts. After transferring £5,000 each to reserve and insurance funds, and paying £773 income-tax to April last, there remains a balance at credit of profit and loss account of £10,022, which is carried forward.

Argentine Navigation Co. (Nicolás Mihanovitch), Ltd.—The report states that gross profits for the year to June 30 amounted to £189,671, from which deduct depreciation, insurance, general charges and administration in the Argentine, £182,756, leaving £6,915. Interest on debentures, London office expenses, directors' fees, &c., amounted to £54,840, and income-tax £3,000, resulting in a loss of £50,925. Of the amount standing to the credit of the general reserve account at June 30, 1914, namely, £41,208, the sum of £16,645 has been transferred to the insurance reserve, and the balance of £24,563 has been applied in writing down the debit balance on profit and loss account. The annual drawings for the redemption of the first mortgage debentures and of the mortgage debentures, 1913, were made in June and March last, under the conditions applicable thereto, when bonds to the amount of £29,600 and £7,500 respectively were drawn and subsequently repaid at par. The net additions to the capital expenditure for the year under review amount to £113,133, which include the balance of the cost of the two turbine steamers purchased in the preceding year. The above sum is arrived at after deducting the book value of the steamship *Centenario* and a tug which have been sold during the year. The directors have again to express their regret at the unfavourable result of the year's working which was due to the continued depression in the Argentine and neighbouring Republics, aggravated by the war. The general conditions in Argentina show distinct signs of improvement, but the effects on the internal transportation trade of the country did not make themselves felt before the close of the financial year.

COMPANY MEETINGS.

Orient Steam Navigation Company, Ltd.—The annual general meeting was held on December 22, at 13, Fenchurch Avenue, London. The chairman, Sir Frederick Green, in moving the adoption of the report, said that the sailings of the steamers differed considerably from those of the previous year, while the number of mail voyages was reduced, and as a consequence the usual trade receipts were less. The profit for the year, outside any possible profit from the underwriting account, after making provision for depreciation and other contingencies, amounted to £200,896, or £26,197 less than in the year 1914. They had, however, £9,830 more to dispose of, owing to the fact that the amount paid in interest was £5,584 less and the carry forward larger by £30,193 than the amount carried forward in 1913. The book value of the fleet and investments was affected by the sale of the *Ophir* and the provision made for depreciation; it now stood at £1,988,573, making an increase of £51,186. The debentures were £19,350 less than at this time last year—the amount the company had been able to redeem to meet the obligations of the trust deed. Freights and passage money paid in advance, owing to the fewer sailings, showed a decline of £113,575. The balance remaining to be carried forward was £96,741, or £9,831 more than at June, 1914. As so large a proportion of their steamers had been taken either by the Admiralty for armed cruisers or by the Commonwealth Government for transports, it had not been possible to carry on the mail service with the regularity that obtained before the war. The managers appreciated the consideration shown the Orient Line by the Commonwealth Government and the Post Office authorities on all occasions. He would also add that they greatly appreciated the spirit in which their passengers had received the frequent postponements and disappointments that they had been unavoidably subjected to. The number of passengers travelling everywhere show the confidence the public had in our Navy, and it had been a matter of extreme satisfaction to shipowners that the Admiralty was able not only to direct, but to protect the movements of the country's mercantile marine, so that a very serious enemy menace had been far less successful than it might have been. Orient steamers were of a class particularly suitable for use as armed cruisers, and the Admiralty had consequently requisitioned a large proportion. In their dealings with both the Transport Department and the Trade Division of the Admiralty they had met with the greatest consideration at all times. It was satisfactory to know that the Orient Company had been able to take its fair share in this great war, both on land and at sea. Of the shore staff out of 87 who were of military age, 61 had joined the King's forces and 94 officers from the sea staff of 135 were serving His Majesty afloat. One of these latter, Lieutenant Watkins, had been honourably mentioned in despatches, and had been promoted a Flight Commander. From a national point of view it was necessary that when this war was over British shipowners should be in a strong position, and, although they must bear their share of taxation, and would do so cheerfully, shipowners wanted the Government to recognise that in the future they would have to meet a serious competition, their competitors, in many cases, being neutrals who had enjoyed a period of unusual prosperity without any heavy tax on profits. It was to be hoped the Government would not impose heavier burdens of taxation than it could carry nor hamper British shipowners with rules and regulations from which their foreign competitors were free.

Sir Kenneth Anderson seconded the motion, which was carried unanimously.

There was launched on November 25, from the Joh. C. Tecklenborg A.G. yards (Geestemunde) a cargo steamer of 11,000 tons register to the order of the Deutschen Dampfschiffahrtgesellschaft Hansa (Bremen). The vessel has been named *Altenfels*. Further particulars are not yet available.

OFFICIAL NOTICES AND SHIPS FOR SALE.

FOR SALE.

(PARTICULARS NOT GUARANTEED.)

Folio 9294.—New Steamer now building. About 7,400 tons d.w. on about 23 ft. 7 in. draught. Shelter Deck Type. Triple Engines. Three Single-ended Boilers. Speed estimated 10 knots.

Folio 9008.—Built 1914. About 7,200 tons d.w. on about 23 ft. 3 in. draught. Two Decks. Triple Engines. Three Single-ended Boilers. About 10–11 knots on about 26 tons.

Folio 7974.—Built 1904. About 6,375 tons d.w. on about 24 ft. 6 in. One Deck Laid. Triple Engines. Two Single-ended Boilers. About 9 knots on about 20 tons. Early delivery.

Folio 6852.—Built 1903. About 3,600 d.w. on about 18 ft. 9 in. draught. Single Deck. Triple Engines. Two Single-ended Boilers. About 9 knots on about 13 tons.

For further Particulars, Plans, Prices, &c., apply to

THOS. PINKNEY & SONS,

Sunderland.

Telegraphic Address:—"Spardeck."

OFFICIAL ADVERTISEMENTS intended for insertion on this page should be sent in as early in the week as possible. The latest time for receiving official advertisements for this page for the current week's issue is noon on Wednesday.

All advertisements should be addressed to

Shipbuilding and Shipping Record,
Queen Anne's Chambers,
Westminster, London, S.W.

NEWS PARAGRAPHS.

Navigazione Liberia.—This company is increasing its capital by about £87,000, the new shares being offered at 162½ per cent.

Contamination of the Elbe.—One of the matters discussed at the recent meeting of the Hamburger Verein fur Flusschiffahrt was the contamination of the Elbe by salts and acids, with consequent damage to the boilers and condensers of Elbe steamers.

Licences for Foreign Trading. Captain Pretyman, replying to Mr. Richards, said the following had been appointed members of the expert committee dealing with the issue of licences permitting British ships to trade between foreign ports:—Mr. Maurice Hill, K.C. (Chairman), Mr. Burton Chadwick, Mr. H. F. Fernie, Mr. F. W. Lewis, Mr. J. P. Purdie, Mr. Harold Sanderson and Mr. A. Scholefield. The number of licences issued from December 1 to December 20 inclusive was 118. The total prohibition of licences was not contemplated.

German Views of British Combines.—Whilst graciously conceding that the position of certain of our shipping companies has been strengthened (as regards their power of competing with German lines) by the formation of combines, *Hansa* asserts that most of these combinations do not consist of large, close-knit companies such as the Hamburg-Amerika and Norddeutscher Lloyd lines, but are loose associations of concerns which maintain most of their independence and are simply held together by certain financial arrangements. The large German owners are held to be much stronger than these combines.

Effect of Internment on Magnetic Deviation.—*Hansa* calls the attention of German shipowners to the fact that since most of their vessels have been laid up for more than a year, the magnetic deviation of the ships will have altered considerably. When the vessels are again placed in service after lying so long on one course, their magnetic condition will be unstable for a time and may easily lead to danger. It is recommended that every interned or laid-up vessel be now reversed at its moorings. The thought of the whole German mercantile marine swinging itself through 180 deg. and returning to another period of idleness is gratifying in the extreme!

The Mitsubishi Goshi Kaisha.—On January 1 next the Mitsubishi Goshi Kaisha will open a branch at 149, Leadenhall Street, London, E.C. In addition to their business of bankers and merchants, this Tokyo firm is well known throughout the East as producers of the finest Japanese steam coal, electrolytic copper, wolfram and tin ores, and other metals; steamship owners, proprietors of the famous dockyards, shipbuilding and engineering works at Nagasaki and Kobe; iron founders; paper makers; owners of public wharves and warehouses, and real estate; refiners and exporters of Chinese oils and cereals, &c. The London office will act in every capacity for all departments and branches.

Spain and Interned Ships.—The Madrid correspondent of the *Daily Telegraph* says that owing to the scarcity of steamship tonnage the Government has taken into consideration the question of purchasing or chartering the German and Austrian steamers detained in Spanish ports. The Director-General of Commerce has caused investigations to be made, which show that enemy ships of over 100,000 tonnage are detained in Spanish ports, and all are at present unproductive. Two sets of opinions exist for the Spanish Cabinet. The Director-General of Commerce, Señor Sala, favours the acquisition of the ships by the State, whilst Señor Urzaiz considers that the scheme, if feasible, should be carried out with private capital. Other Ministers agree with the Finance Minister.

COMPANY REGISTRATIONS.

T. A. Ruf & Co., Ltd.—Capital, £1,000 in £1 shares. Objects, to carry on the business of general merchants, shipowners and charterers, ship and insurance brokers, and to adopt an agreement with Max Ruf. First directors, Max Ruf, Theodore A. Ruf and John A. T. Sherman. Registered office, 35, Crutched Friars, E.C. Private company.

George J. Emanuel & Co., Ltd.—Capital, £5,000 in 1s. shares (25,000 "A" and 75,000 "B"). Objects, to carry on the business of insurance, ship and chartering agents and brokers. First directors, C. J. Emanuel, 2, St. Michael's House, Cornhill (permanent), and others yet to be nominated. Registered office, 2, St. Michael's House, Cornhill, E.C. Private company.

Frutera Line, Ltd.—Capital, £150,000 in £1 shares. Objects, to carry on the business of shipowners and builders, ship and insurance brokers, managers of shipping property. First directors, T. Hamilton Miller and E. Armstrong (both permanent). Qualification, £1,000. Registered office, 25, Queen Street, Newcastle-on-Tyne. Private company.

SHIPPING SHARE MARKET.

The closing of the Stock Exchange from Friday to Tuesday morning practically stopped business for the past week, even supposing investors had any desire to study their investment lists during the holiday period. No further information has transpired regarding the reports which were current just before Christmas regarding an amalgamation between the Royal Mail, the Cunard and Furness, Withy & Co., and members are not inclined to regard the reports as serious. The buying of Royal Mails is regarded as having been based upon prospects for the current year and the fact that the question of compensation by the Government in connection with the commandeering of the company's Southampton docks has been satisfactorily settled. The huge grain import from the Argentine on behalf of the British Government is also looked upon as a "bull" point for River Plate shipping. The close of the year shows that investors have not found their confidence in steamship companies' securities misplaced. A comparison of the prices ruling during this, the last week of 1915, with the corresponding period of 1914, indicates changes throughout the list almost entirely in favour of holders. All the leading shares could be sold at higher prices, and, taking into account the higher dividends paid this year, it would be possible for investors who put £10,000 into steamship companies' shares at the end of 1914 to sell out with a profit ranging from 20 per cent. to 25 per cent. In no other markets, not excepting even Americans, would it have been possible for investors to do this. Nor do prospects for the forthcoming twelve months appear any less bright. In some instances the new year's profits may already be fully discounted in current quotations, but there are many debentures which yield 5¼ per cent. and over that afford good opportunity for the investor, whilst for those persons more speculatively inclined there are the preference shares of established companies carrying some years' arrears of dividend. It is not out of place at the commencement of a new year to warn our readers once again to make their investment selections from established undertakings, in preference to the scores of new shipping concerns that have come into existence owing to the "boom." Instances have already occurred where vendor's shares of new companies which have paid a big dividend out of "War profits" have been unloaded on the market at high premiums, and this device for outwitting the Treasury's request for no new issues to be made, is being actively engineered by the operations of inside firms and the circulars of outside institutions. It is quite probable that after the war these shares will fall back to the nominal valuation they stood at some time ago.

Owing to the closing of the Stock Exchange during the holidays and the few markings that have taken place, our customary Share Table is held over until next issue.

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF MARINE CASUALTIES

(Including losses incidental to the war).

Vessel.	Gross Tonnage.	Owners, Builders and Year Built.	Casualty.
Bangkoku Maru, ss.	6,100	Goshi Kaisha Kishimoto Shokai, Dairen .. C. Connell & Co., Glasgow. (1897.)	NOV. 30: Portland (O.) for Shanghai. Cargo lumber, steel, glue and gasolene. Encountered typhoon; about 10,000 ft. of lumber washed overboard, steering gear carried away, &c.
Belford, ss.	516	Ford S.S. Co. (Manx. Macneal & Co.). Glasgow R. Duncan & Co., Pt. Glasgow.	DEC. 21: Reported "sunk." Crew saved.
Coftingham, ss.	513	Jas. Little & Co. (Glasgow), Ltd., Glasgow.. Goole S.B. & R. Co., Goole. (1907.)	DEC. 27: Reported "sunk."
Hadley, ss.	1,777	W. Cory & Son, London .. .. .. S. P. Austin & Son, Sunderland. (1901.)	DEC. 27: Reported "sunk."
Huntly, ss. (ex German *Ophelia*)	1,153	A. Kirsten, Hamburg .. .. Flensburger S.G., Flensburg. (1912.)	DEC. 21: Reported "sunk."
Karin, ss. .. .	1,136	Angf. Aktieb. Karin (A. Andersson). Helsingborg Howaldtswerke, Kiel. (1897.)	DEC. 14: Cardiff for Barcelona. Feared she has foundered in gale in Bay of Biscay on Nov. 12.
Leros, ss.	2,679	Deutsche Levante Linie, Hamburg .. .. A.G. "Neptun," Rostock. (1905.)	DEC. 22: Reported "sunk."
Ministre Beernaert, ss. ..	4,215	Cie. Royale Belgo-Argentine (Armement Adolf Deppe), Antwerp Northumberland S.B. Co., Newcastle. (1907.)	DEC. 27: Reported "sunk."
Orange Prince, ss. .	3,583	Prince Line (J. Knott), Newcastle .. .. Tyne Iron S.B. Co., Newcastle. (1894.)	DEC. 27: Reported "sunk."
Ville de la Ciotat, ss .	6,390	Messageries Maritimes, Marseilles .. .. Messageries Maritimes, La Ciotat. (1892.)	DEC. 27: Reported "sunk" in Mediterranean.
Yasaka Maru ss.	10,932	Nippon Yusen Kaisha, Tokio .. .. Kawasaki Dockyard Co., Kobe. (1914.)	DEC. 23. Reported "sunk."
Yeddo, ss.	4,552	Bank Line (A. Weir & Co.) Glasgow .. Russell & Co., Pt. Glasgow. (1901.)	DEC 27 Reported "sunk."

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF SHIP SALES.

Name and type.	Tonnage.	Dimensions. Draught in ( ).	Sold by, to	Builders, hull and year.	Machinery and builders.	Remarks.
Ancon, s.v. ..	1,454 gr. 1,334 net. 2,210 d.w.	236½′ × 36′ 21½′	Act. "Ancon" (R. Salvesen & Co.), Tvedestrand, Norway, to H. Jacobsen, Billet	Russell & Co., Greenock (1894)	—	Price about £11,750.
Annie, s.v. (ex *Burgemeester Jonkheer Coenen*)	1,490 gr. 1,373 net.	337½′ × 37′ × 21½′	W. G. Christians, Swansea, to Norwegian buyers	Rijkee & Co., Katendrecht (1891)	—	—
Anyo Maru, ss. (well dk.) (ex *Apex*, ex *Baross*, ex *Apex*)	2,169 gr. 1,345 net. 3,140 d.w.	276′ × 37½′ 18½′	U. Iwaki, Dairen, to buyers not stated	Palmers Co., Newcastle (1888)	22, 35, 58 × 42 (Palmers Co.)	Price about £19,700.
Cayo Domingo, ss. (spar dk.)	2,717 gr. 1,713 net. 4,860 d.w.	315½′ × 43′ × 16¼′ (23½′)	Cuban SS. Co. (E. Bigland & Co.), London to Hudson Bay SS. Co.	Swan, Hunter & Wigham Richardson, Newcastle (1904)	24, 38, 64 × 42 (N.E. Marine Eng. Co., Newcastle)	Price about £325,000 the three.
Cayo Gitano, ss. (spar dk.)	3,073 gr. 1,983 net. 5,270 d.w.	330½′ × 45′ × 15¾′ (22¾′)	Cuban SS. Co. (E. Bigland & Co.), London, to Hudson Bay SS. Co.	J. Readhead & Sons, S. Shields (1905)	24½, 40, 66 × 45 (J. Readhead & Sons)	
Cayo Soto, ss. (spar dk.)	3,082 gr. 1,988 net. 5,290 d.w.	330½′ × 45 × 15¾′	Cuban SS. Co. (E. Bigland & Co.) London, to Hudson Bay SS. Co.	J. Readhead & Sons, S. Shields (1905)	24⅝, 40, 66 × 45 (J. Readhead & Sons)	
Daihoku Maru, ss. (spar dk.) (ex *Ville de Metz*)	3,700 gr. 2,685 net.	351′ × 42¼′ × 18½′	S. Fukagawa, Dairen, to buyers not stated	J. Laing, Sunderland (1887)	28½, 46½, 76 × 45 (G. Clark, Sunderland)	Price about £23,000.
Dalegarth, ss. (well dk.)	2,265 gr. 1,434 net. 3,440 d.w.	290′ × 39′ 18½′ (20½′)	Hanson, Brown & Co (Newcastle-on-Tyne), Ltd., to Cityof London SS. & Trading Co., London	J. Readhead & Sons, S. Shields (1889)	22, 36, 60 × 39 (J. Readhead & Sons)	—
Kilbride, ss. ..	3,712 gr. 2,385 net. 6,510 d.w.	354′ × 45′ 25½′ (23½′)	Connell Bros., Ltd. Glasgow, to Furness, Withy & Co.	C. Connell & Co., Glasgow (1901)	25, 41, 66 × 45 (Dunsmuir & Jackson, Glasgow)	Price about £65,000.
Kilchattan, ss. (spar dk.)	3,758 gr. 2,418 net. 6,610 d.w.	361½′ × 47½′ 17¾′ (24′)	Connell Bros., Glasgow, to Furness, Withy & Co.	C. Connell & Co., Glasgow (1906)	25½, 42, 68 × 45 (Dunsmuir & Jackson, Glasgow)	Price about £90,000.
Kilkerran, ss. (spar dk.)	3,755 gr. 2,413 net. 6,610 d.w.	361½′ × 47½′ × 17¾′ (24¼′)	Connell Bros., Glasgow, to Furness, Withy & Co.	C. Connell & Co., Glasgow (1906)	25½, 42, 68 × 45 (Dunsmuir & Jackson, Glasgow)	Price about £90,000.
Penylan, ss. (spar dk.) (ex *Okehampton*)	3,875 gr. 2,531 net. 6,430 d.w.	340¼′ × 47½′ × 20′ (24¼′)	G. H. Mitchell & Co., London, to British buyers	R. Stephenson & Co., Newcastle (1906)	25, 41, 67 × 45 (N.E. Marine Eng. Co., Newcastle)	Price about £72,000.
Pontop, ss. ..	3,042 gr. 1,971 net. 5,310 d.w.	325′ × 47′ 22½′ (21′)	Sold to Petersen & Co., London	Furness, Withy & Co., W. Hartlepool (1904)	23½, 38, 64 × 42 (Richardsons, Westgarth & Co., Hartlepool)	Price about £56,000.
Tromp, ss. (ex *Dunrobin*)	2,751 gr. 1,752 net. 4,610 d.w.	320′ × 46½′ 21′ (20′)	Stoomv. Maats. Tromp (J. F. & F. Schellen), Rotterdam, to Norwegian buyers	Craig, Taylor & Co., Stockton (1898)	22½, 36, 60 × 42 (Black, Hawthorn & Co., Gateshead)	Price about £75,000.

"INTERNATIONAL"
(Regd.)

ANTICORROSIVE AND ANTIFOULING COMPOSITION.

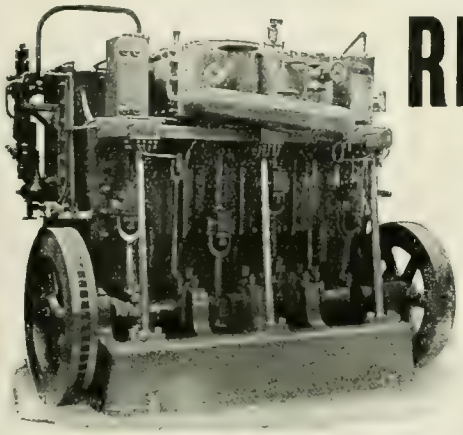
"LAGOLINE PAINTS"
(Regd.)

Over 18 million tons of shipping coated during 1913.

TRADE MARK.

HOLZAPFELS LIMITED,
HEAD OFFICE & WORKS NEWCASTLE-UPON-TYNE.
And at LONDON, LIVERPOOL, GLASGOW, CARDIFF. Agencies at all Ports.

A BRITISH COMPANY EMPLOYING ALL BRITISH LABOUR.



REFRIGERATING MACHINERY
(CARBONIC ANHYDRIDE and AMMONIA COMPRESSION SYSTEMS).

for Cooling Ammunition Rooms, Storage of Provisions, Carriage of Chilled and Frozen Meat, Fruit, etc., and making ice

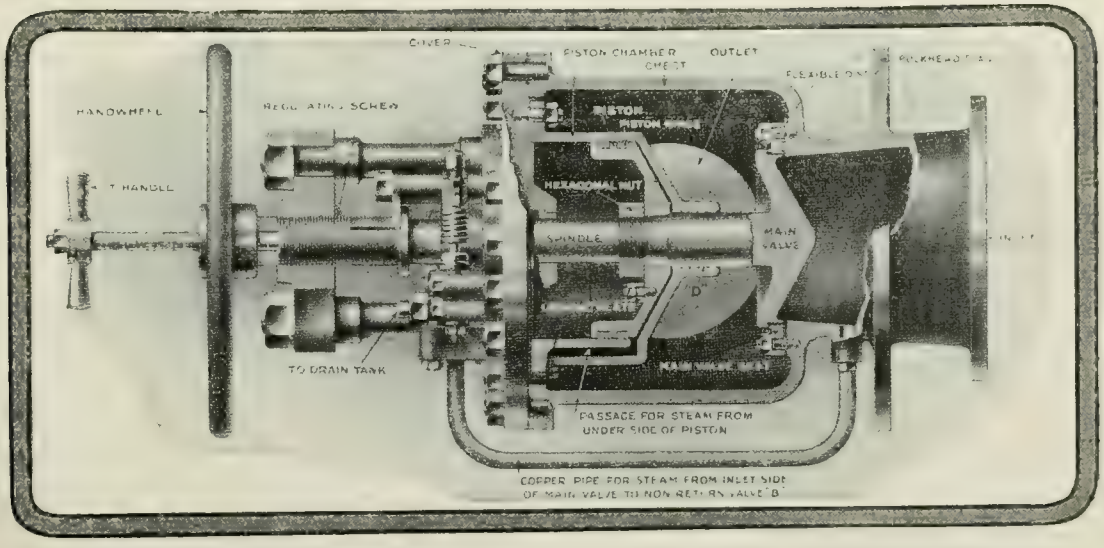
as supplied to

THE BRITISH AND FOREIGN NAVIES & THE LEADING STEAMSHIP LINES.

J. & E. HALL, Ltd.,
DARTFORD IRONWORKS, KENT, and 10, ST. SWITHIN'S LANE, LONDON, E.C.

COMBINED BULKHEAD SELF-CLOSING AND EMERGENCY SHUT-OFF VALVE.
(PATENTED.)

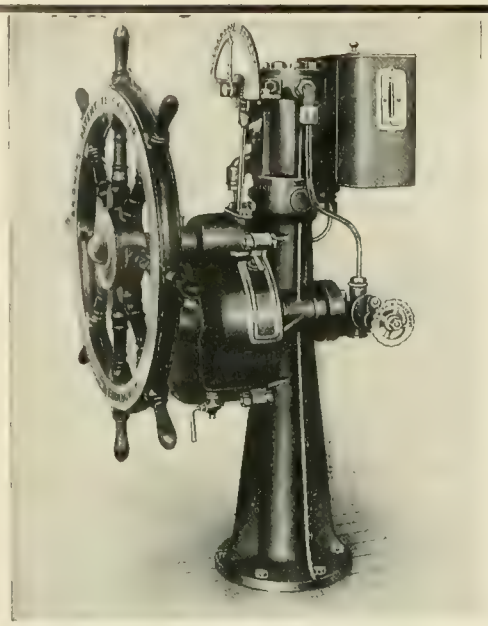
TAKES THE PLACE OF TWO VALVES.



MINIMUM WEIGHT. STEAM TIGHT.
PERMITS ADOPTION OF VERY LIGHT CONTROL GEAR.

SOLE MAKERS: **COCKBURNS, LIMITED,**
ESTABLISHED 1862. **CARDONALD, near GLASGOW.** TELEGRAMS:— "COCKBURN, GLASGOW."

To face last text.



PATENT HYDRAULIC STEERING TELEMOTOR.

BROWN'S STEERING GEARS

Steam, Hydraulic and Electro-Hydraulic.

TELEMOTORS FOR STEERING AND HELM SIGNALS.

COMPLETE INSTALLATIONS OF HYDRAULIC CARGO WORKING GEAR FOR SHIPS.

DIRECT-ACTING REVERSING AND TURBINE CONTROL ENGINES.

ELECTRO-HYDRAULIC STEERING GEARS, WINCHES, CRANES, BOAT HOISTS, CAPSTANS, &c.

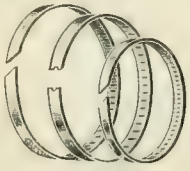
IRON FOUNDERS. BRASS FOUNDERS.

ON ADMIRALTY LIST.

BROWN BROTHERS & CO., Ltd.,

Rosebank Ironworks, EDINBURGH.

Telegrams—"HYDRAULIC." Telephone—CENTRAL 8931-2.



HAMMERED CAST IRON PISTON RINGS

(By the Davy Robertson Process). All sizes from 2½ in. to 72 in. in our SPECIAL PISTON RING IRON

THE STANDARD PISTON RING & ENGINEERING CO. LTD.,

Premier Works,

DON ROAD, SHEFFIELD.

THOS. DIAMOND & CO.,

Engineers, Boilermakers, General Ship Repairers and Boat Builders, CARDIFF.

Commercial Dry Dock, 600 feet × 60 feet.

OXY-ACETYLENE WELDING A SPECIALITY.

Telegrams: "Decks, Cardiff." Telephone: 4746 (Private Branch Exchange).

LARGEST DRY DOCKS IN THE BRISTOL CHANNEL.

BARRY GRAVING DOCK & ENGINEERING CO., LTD.

Best facilities for Dispatch of Repairs of every description.

TELEGRAMS: "BARDOCK, BARRY." TELEPHONES { No. 290 BARRY (5 lines.) / No. 7 BARRY (night calls.)

Every thinking British Merchant Captain or Officer joins as a matter of course

THE IMPERIAL MERCHANT SERVICE GUILD.

It regulates the multitudinous affairs of the profession and has secured for it material benefits of incalculable value.

If a Captain send **30s.**, if an Officer **17s. 6d.**, to the Secretary,

Lieut. T. W. MOORE, R.N.R., The Arcade, Liverpool,

(Agencies also in the leading shipping districts), and your professional interests are protected forthwith.

JOHN SHEARMAN & CO., LIMITED

CARDIFF. BARRY. NEWPORT. AVONMOUTH.

UP-TO-DATE PLANTS FOR QUICK REPAIRS
—PNEUMATIC AND ELECTRIC DRILLS—

Dry Docks for { Barry - 4 Steamers / Cardiff - 2 ,, } Avonmouth - 2 Steamers / Newport - - 2 ,,

Telegrams: (each place) "Shearman."

TELEGRAPHS

ENGINE, DOCKING, STEERING, &c.

A. ROBINSON & Co., Ltd., Knowsley Rd., Bootle.

Contractors to British Admiralty and Foreign Governments.

DAWSON & DOWNIE,

CLYDEBANK.

PUMPS FOR MARINE INSTALLATIONS.

PATENT DIRECT-ACTING FEED & SERVICE PUMPS.
IMPROVED VERTICAL DUPLEX PUMPS.

CASE HARDENING COMPOSITION.

CASE HARDENING BOXES.

CASE HARDENING OIL.

BRITISH MADE.

JOHN ELSE & SON, Ltd., 48, Muntz St., Birmingham.

LIVERPOOL PATENTS CO., LTD.

PATENT "TRIDENT" FIREBARS

36,000 Furnaces already fitted.

Branches:—London, Glasgow, West Hartlepool.

Agencies:—Cardiff, Sunderland, etc., and abroad.

Head Offices:—DERBY SQUARE, JAMES ST., LIVERPOOL.

WEBSTERS COMPOSITIONS

Satisfactory Results. Reasonable in Cost.

FOR SHIPS' BOTTOMS, Etc.

Used by Shipowners for

SIXTY YEARS—and are **TO THE FORE TO-DAY.**

Agents and Stocks at Various Ports.

Telegraphic Address: "Enamel" Hull.

WEBSTERS LIMITED, HULL.

Telephone: No. 734 Corporation.

Buyers' Guide.

LIST OF THE LEADING MAKERS OF SHIPBUILDING & SHIPYARD & DOCK MACHINERY, APPLIANCES, PLANT & STORES.

ACCOMMODATION LADDERS—
Linkleter's Patent Ship Fittings Co., Hudson St., North Shields.

ACETYLENE—
Carbic Ltd., 51, Holborn Viaduct, London, E.C.

AERIAL ROPEWAYS—
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

AIR COMPRESSORS—
Belliss & Morcom, Ltd., Birmingham.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, S.E.
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Belliss & Morcom, Ltd., Birmingham.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Dawson & Downie, Elgin Works, Clydebank.
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Weir, G. & J., Ltd., Cathcart, Glasgow.

ALUMINIUM GOODS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

ALUMINIUM PAINT—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

ANCHORS— [Sunderland.
Byers, W. L., & Co., Ltd., Tavistock House, Sunderland.
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs. [on-Tyne.
Spencer, John, & Sons, Ltd., Steel Works, Newburn-
Sykes, Richard, & Son, Ltd., Cradley Heath.
Taylor, Samuel, & Sons (Brierley Hill), Ltd., Brierley Hill, Staffs.
Wright, Joseph, & Co., Ltd., Tipton, Staffs.

ANTI-CORROSIVE COMPOSITIONS—
Briggs, W., & Sons, Ltd., Dundee.
Hamilton, Archd., & Co., Possilpark, Glasgow.
Holzapfels, Ltd., Newcastle-on-Tyne.
Hoyle, Robson, Barnett & Co., Ltd., St. Nicholas Chambers, Newcastle-on-Tyne.
Milburn, A., & Co., Sunderland.
Wailes Dove Bitumastic Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.
Websters Ltd., Hull.

ANTI-FOULING COMPOSITION—
Holzapfels, Ltd., Newcastle-on-Tyne.
Hoyle, Robson, Barnett, & Co., Ltd., St. Nicholas Chambers, Newcastle-on-Tyne.
Websters Ltd., Hull.

ANTI-FRICTION METALS—
Bowran, Robt., & Co., Ltd., Newcastle-on-Tyne.
Delta Metal Co., Ltd., East Greenwich.
McConwell, A., & Co., Ltd., 60, Drury Buildings, Water Street, Liverpool.

ARMOUR PLATES—
Brown, John, & Co., Ltd., Atlas Works, Sheffield.

ASBESTOS FITTINGS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

ASBESTOS GOODS—
Beldam Packing & Rubber Co., Ltd., 1 and 2, Gracechurch Street, London, E.C.
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.
Walker, Jas., & Co., 11, Bishop Court, Anderston, Glasgow.

ASH BAGS—
Speedings Ltd., Sail Works, Sunderland.

ASH BINS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Hingley & Lamb, Ltd., Stour Works, Lye, Worcs.

ASH DISCHARGING APPLIANCES—
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.
Trewent & Proctor, F. J., Ltd., 43, Billiter Buildings, E.C.

AWNINGS—
Speedings Ltd., Sail Works, Sunderland.

BARROWS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

BARROWS (Cargo)—
Edina Manufacturing Co., 19h, Broad Wynd, Leith.

BEDDING & NAPERY— [Glasgow.
Stewart, Archibald & Co., 40-48, Union Street,

BEMAL CONDENSER TUBES—
Yorkshire Copper Works, Ltd., Leeds.

"BITUMASTIC" ENAMEL MANUFACTURERS—
Wailes Dove Bitumastic Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.

BLINDS—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.

BLOCKS—
Higginson & Co., 7, Hurst Street, Liverpool.

BLOWERS—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford. [Belfast.
Davidson & Co., Ltd., Sirocco Engineering Works,
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

BOATS—
Crichton, J., & Co., Saltney Shipyard, Chester.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.

BOILERS—
Central Marine Engine Works, West Hartlepool.
Elliot & Jeffery, East Dock, Cardiff.
Harris Bros., Ltd., Cambrian Dry Docks, Swansea.
Hawthorn, R. & W., Leslie & Co., Ltd., St. Peter's, Newcastle-on-Tyne.
Howden, James, & Co., Ltd., Scotland St., Glasgow.
Perman & Co., Ltd., 82-83, Fenchurch Street, E.C.
Wallsend Slipway & Engineering Co., Ltd., Wallsend-on-Tyne.
White, J. Samuel, & Co., East Cowes, I.W.

BOILER CIRCULATORS—
Beresford Eng'n'ring Co., Beresford Lane, Cardiff.

BOILER CLEANER—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

BOILER COMPOSITION—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

BOILER COVERING—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.
Walker, Jas., & Co., 11, Bishop Court, Anderston, Glasgow.

BOILER MOUNTINGS—
Cockburns Ltd., Cardonald, Nr Glasgow.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

BOILER PLATES (Steel)—
Leeds Forge Co., Ltd., Leeds.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.

BOILER PRESERVATIVE—
Atlas Preservative Co., Ltd., Deptford, S.E.

BOILER TUBES—
Yorkshire Copper Works, Ltd., Leeds.

BORING MACHINES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.
Greenwood & Batley, Ltd., Albion Works, Leeds.

BRASS & COPPER FITTINGS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

BRASS & COPPER RODS—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

BRASS FOUNDERS—
Billington & Newton, Ltd., Longport, Staffs.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow. [Street, Glasgow.
McGeoch, Wm., & Co., Ltd., 28, West Campbell
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.
Williams, Wm., Alexandra Brass Foundry, Cardiff.

BRASS NAME-PLATES—
Metograph Co., 280, Cathedral Street, Glasgow.
Rennie & Co., North Greenhill Road, Paisley.

BRASS TUBES—
Yorkshire Copper Works, Ltd., Leeds.

BRASSWORK—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.

BRONZE (Manganese)—
Billington & Newton, Ltd., Longport, Staffs.
Bowran, Robt., & Co., Ltd., 4, St. Nicholas Buildings, Newcastle-on-Tyne.
Delta Metal Co., Ltd., E. Greenwich, London, S.E.
Stone, J., & Co., Ltd., Deptford, London, S.E.

BRIGHT STEEL—
Stonehouse Works Co., Ltd., Houghton Street, West Bromwich.

BUCKETS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Hingley & Lamb, Ltd., Stour Works, Lye, Worcs.

BULKHEADS (Patent)—
Hogg-Carr Construction Co., Ltd., Newcastle-on-Tyne.

BUOYANT DECK SEATS— [Liverpool.
Crichton, C. & H., Ltd., Huskisson Engine Works,
Linkleter's Patent Ship Fittings Co., Hudson Street, North Shields.

BUOYS—
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool.
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs.

CABINET MAKERS—
Stewart, Archibald & Co., 40-48, Union Street, Glasgow.

CABLES (Chains)—
Byers, W. L., & Co., Ltd., Tavistock House, Sunderland.
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs.
Sykes, Richard, & Son, Ltd., Cradley Heath.
Taylor, Samuel, & Sons (Brierley Hill), Ltd., Brierley Hill, Staffs.
Wright, Joseph, & Co., Ltd., Tipton, Staffs.

CAISSONS & DOCK GATES—
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne.

CALORIFIERS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

CAPSTANS (Electric)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.
Stothert & Pitt, Ltd., Bath.

CARGO BLOCKS—
Higginson & Co., 7, Hurst Street, Liverpool.

CARPETS—
Stewart, Archibald & Co., 40-48, Union St., Glasgow.

CASE HARDENING BOXES—
Else, John, & Son, Ltd., 48, Muntz St., Birmingham

CASE HARDENING COMPOSITION—
Else, John, & Son, Ltd., 48, Muntz St., Birmingham

CASE HARDENING OIL—
Else, John, & Son, Ltd., 48, Muntz St., Birmingham

CAST BRASS PLATES—
Brown, Robert, & Co., 12, Espedair St., Paisley.

CASTINGS (Brass)—
Dixon, S., & Sons, Ltd., Leeds.

CASTINGS (Steel)—
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.
Stewarts & Lloyd's, Ltd., 41, Oswald St., Glasgow.

CASTINGS (Steel, Iron and Brass)—
Darlington Forge Co., Ltd., Darlington.
Hamilton, A., & Sons, 120, Bute Crescent, Docks, Cardiff.

CEMENT—
Aberthaw & Bristol Channel Portland Cement Co., Ltd., Merthyr House, Cardiff. Cranstonhill, Glasgow.

COAL—
Beynon, T., & Co., Ltd., Merthyr House, Cardiff.
Cambrian Collieries, Ltd., Cambrian Bldgs., Cardiff.
Davis, D., & Sons, Ltd., Cymric Bldgs., Cardiff.
Ebbw Vale Steel, Iron & Coal Co., Ltd., Merthyr House, Cardiff.
Fernhill Collieries, Ltd., Merthyr House, Cardiff.
Glamorgan Coal Co., Ltd., Cambrian Bldgs., Cardiff.
Harrisons (London), Ltd., 66, Mark Lane, E.C.
Naval Colliery Co. (1897), Ltd., Cambrian Bldgs., Cardiff.
Newport Abercarn Black Vein Steam Coal Co., Ltd., Merthyr House, Cardiff.
Powell Duffryn Steam Coal Co., Ltd., Cardiff.
Rhymney Iron Co., Ltd., Merthyr House, Docks, Cardiff.

COAL HANDLING PLANT—
Spencer & Co., Ltd., Melksham, Wilts.

COMPASSES (Ship)—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.

CONDENSERS—
Bellis & Morcom, Ltd., Birmingham.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Dawson & Downie, Elgin Works, Clydebank.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

CONDENSER TUBES (Brass and Copper)—
Yorkshire Copper Works, Ltd., Leeds.

CONTROLLERS & CONTROL GEAR—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne.

CONVEYORS—
Mather & Platt, Ltd., Manchester.
Spencer & Co., Ltd., Melksham, Wilts.

COOKING APPARATUS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Grieve, T., & Sons, Bedford Street, North Shields.

COPPER PIPES—
Yorkshire Copper Works, Ltd., Leeds.

COPPERSMITHS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

COPPER TUBES—
Yorkshire Copper Works, Ltd., Leeds.

CORK INSULATION—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

CORRUGATED IRON—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

COUNTER (Engine)—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.

CRANES—
Ransomes & Rapier, Ltd., 32, Victoria St., S.W.
Stothert & Pitt, Ltd., Bath.

CYLINDERS (Copper)—
Yorkshire Copper Works, Ltd., Leeds.

DELTA METAL—
Delta Metal Co., Delta Works, East Greenwich, S.E.

DERRICKS & DAVITS—
Howden, James, & Co., Ltd., 95, Scotland Street, Glasgow.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.

DISTILLING APPARATUS—
Royles Ltd., Irlam, Nr. Manchester.

DIVING APPARATUS—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, S.E.
Mining Engineering Co., Ltd., Meco Works, Moorfields, Sheffield.

DOCK & SHIP LIGHTING—
Carbic Ltd., 51, Holborn Viaduct, London, E.C.

DOCK GATES—
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow.
Hamilton, Wm., & Co., Ltd., Port Glasgow, Scotland.
Swan, Hunter & Wigham Richardson, Ltd. Wallsend-on-Tyne.

BUYERS' GUIDE—*continued.*

DOORS (Watertight)—
[illegible]

DREDGE PLANTS— [Glasgow.
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow.
[illegible]

DREDGING—
Lilbury Contracting & Dredging Co., Ltd., Queen Anne's Chambers, Westminster, London, S.W.

DRILLING MACHINES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

DRILLS—
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

DRILLS (Pneumatic and Electric)—
United States Metallic Packing Co., Ltd., Bradford.

DRY FITTINGS (Laundry)—
Bradford, T., & Co., Salford, Manchester.

DYNAMOS—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.

ELECTRIC CRANES—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [Edinburgh.
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.
Mather & Platt, Ltd., Manchester.
Ransomes & Rapier, Ltd., 32, Victoria Street, London, S.W.
Stothert & Pitt, Ltd., Bath.

ELECTRIC DERRICKS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRIC DYNAMOS & MOTORS—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-
Mather & Platt, Ltd., Manchester. on-Tyne.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC FITTINGS—
Durham, Churchill & Co., Grimesthorpe, Sheffield.

ELECTRIC HEATING & COOKING APPARATUS—
British Thomson-Houston Co., Ltd., Rugby.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.

ELECTRIC LAMPS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Machester.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.

ELECTRIC LIGHTING—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC-LIGHTING PLANT—
British Thomson-Houston Co , Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC MOTORS—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC WIRES—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRICAL CONTRACTORS—
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow. [Glasgow.
Martin, W. C., & Co., 10, West Campbell Street,
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd. Sunderland.

ELECTRICAL ENGINEERS—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.
Graham, Alfred, St. Andrew's Works, Crofton Park Road, S.E.
Holmes, J. H., & Co., Portland Road, Newcastle-
Mather & Platt, Ltd., Manchester. [on-Tyne.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRICAL INSTRUMENTS (Ammeters)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

ELECTRICAL INSTRUMENTS (Circuit Breakers)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

ELECTRICAL INSTRUMENTS (Relays)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

ELECTRICAL INSTRUMENTS (Voltmeters)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

EMERY WHEELS—
Sterne, L., & Co., Ltd., Crown Iron Works, Glasgow.

ENAMEL MANUFACTURERS—
Holzapfels, Ltd., Newcastle-on-Tyne.
Wailes Dove Bitumastic Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.
Websters Ltd., Hull.

ENGINE (Electric Light)—
Belliss & Morcom, Ltd., Birmingham.
Greenwood & Batley, Ltd., Albion Works, Leeds.

ENGINES (Marine)—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Central Marine Engine Works, West Hartlepool.
Fair, Walter D., & Co., 43, Leicester Square, London, W.C.
Hawthorn, R. & W., Leslie & Co., Ltd., St. Peter's, Newcastle-on-Tyne.
Howden, James, & Co., Ltd., Scotland St., Glasgow.
Perman & Co., Ltd., 82-83, Fenchurch Street, E.C.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

ENGINE & DECK STORES—
McGeoch, Wm. & Co., Ltd., 28, West Campbell Street, Glasgow.
Metallic Valve Co., Colonial House, Water Street, Liverpool.

ENGINE AUXILIARIES—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.

ENGINE FITTINGS—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

ENGINE-ROOM OUTFITS—
Grieve, T., & Sons, Bedford Street, North Shields.

ENGRAVERS—
Brown, Robert, & Co., 12, Espedair St., Paisley.

EVAPORATORS—
Central Marine Engine Works, West Hartlepool.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.

EXTRUDED METALS (Brass, Bronze, Copper, Delta Metals)—
Delta Metal Co., Ltd., E. Greenwich, London, S.E.

FANS—
Adam, J. M., & Co., Greenfield Iron Works, Dalmarnock, Glasgow.
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg., Co., Ltd., Trafford Park, Manchester. [Belfast.
Davidson & Co., Ltd., Sirocco Engineering Works,
Hogan & Wardrop, 2, Gresham Buildings, Basinghall Street, London, E.C.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

FEED-WATER HEATERS—
Beresford Eng'n'ring Co., Beresford Lane, Cardiff.
Central Marine Engine Works, West Hartlepool.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.

FILES—
Brown, John, & Co., Atlas Works, Sheffield.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

FILTERS (Marine)—
Central Marine Engine Works, West Hartlepool.
Cockburns, Ltd., Cardonald, Nr. Glasgow.
Mather & Platt, Ltd., Manchester.

FIREBARS—
Liverpool Patents Co., Ltd., Derby Square, James Street, Liverpool.

FIRE EXTINGUISHERS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Mather & Platt, Ltd., Manchester.

FIRE-FIGHTING APPLIANCES—
Mining Engineering Co., Ltd., Meco Works, Sheffield.

FLAGS—
Speedings, Ltd., Sail Works, Sunderland.

FLOATING DOCKS—
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow. [Scotland.
Hamilton, Wm., & Co., Ltd., Port Glasgow,
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.

FLOOR COVERING—
Docker Bros., Ltd., Metropolitan Road, Saltley, Birmingham.

FORCED DRAUGHT—
Adam, J. M., & Co., Greenfield Iron Works, Dalmarnock, Glasgow. [Belfast.
Davidson & Co., Ltd., Sirocco Engineering Works,
Howden, J., & Co., Ltd., Scotland Street, Glasgow.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

FORGING PRESSES—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.

FORGINGS—
Brown, John & Co., Ltd., Atlas Works, Sheffield.
Darlington Forge Co., Ltd., Darlington.
Hingley & Sons, Ltd., Netherton Iron Works, Staffs.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

FORGINGS (Bronze)—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

FORGINGS (Steel)—
Brown, John, & Co., Ltd., Atlas Works, Sheffield.
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

FUMIGATORS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.

FURNACE BRIDGES—
Hamilton, A., & Sons, 13, Bute Crescent, Docks, Cardiff.
McConwell, A., & Co., Ltd., 60, Drury Buildings, Water Street, Liverpool.

FURNACES—
Brown, John, & Co., Ltd., Atlas Works, Sheffield.
Deighton's Patent Flue & Tube Co., Ltd., Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.
Piggott, T., & Co., Ltd., Birmingham.

GALLEY GEAR—
Grieve, T., & Sons, Bedford Street, North Shields.

GALVANIZERS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

GAS ENGINES—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Mather & Platt, Ltd., Manchester.

GAUGES—
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

GEAR CUTTING—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

GEARING—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds

GEARS—
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

GEARS (Noiseless or Silent)—
British Thomson-Houston Co., Ltd., Rugby.
Brown, David, & Sons (Hfd.), Ltd., Huddersfield.

GOVERNORS—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.

GRAIN DISCHARGING PLANT—
Spencer & Co., Ltd., Melksham Wilts.

GRINDING MACHINES—
Greenwood & Batley, Ltd., Albion Works, Leeds.

GRINDING WHEEL MACHINES—
Sterne, L., & Co., Ltd., Crown Iron Works, Glasgow

HATCH COVERS (Patent)—
Hogg-Carr Construction Co., Ltd., Newcastle-on-Tyne.

HEATING APPARATUS—
Royles, Ltd., Irlam, Nr. Manchester.
Saunders & Taylor, Ltd., 43, Lower Mosley Street, Manchester.

HEATING ENGINEERS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles, Ltd., Irlam, Nr. Manchester.
Saunders & Taylor, Ltd., 43, Lower Mosley Street, Manchester.

HELM SIGNAL TELEMOTORS—
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.

HIGH SPEED DRILLS—
Brown, John, & Co., Atlas Works, Sheffield.

HIGH SPEED STEEL—
Brown, John, & Co., Atlas Works, Sheffield.

HOISTS—
Mather & Platt, Ltd., Manchester.
Stothert & Pitt, Ltd., Bath.
Waygood-Otis, Ltd., Falmouth Road, S.E.

BUYERS' GUIDE—*continued.*

HOSE—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.

HYDRAULIC CRANES—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Brown Brothers & Co., Ltd., Rosebank Iron Works, Edinburgh.
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh

HYDRAULIC MACHINERY—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Waygood-Otis, Ltd., Falmouth Road, S.E.

HYDRANTS—
McRobbie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

INDIARUBBER—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London S.E.

INDICATORS—
Robinson, A., & Co., Ltd., Bootle, Liverpool.

INDUCED DRAUGHT—
Davidson & Co., Ld., Sirocco Eng'n'g W'rks, Belfast
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

INSULATIONS—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W. [Liverpool.
Liverpool Refrigeration Co., Ltd., Colonial House,

IRON ROOFS AND BUILDINGS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

JOINTING MATERIAL (Manganesite)—
Hudson & Co.'s Successors, John, 15, Victoria Warehouses, Mansell Street, E.C.

LAMPS AND LIGHTS—
Grieve, T., & Sons, Bedford Street, North Shields.
Kaye, Joseph, & Sons, Ltd., Leeds.

LAUNCHES—
Crichton, J., & Co., Saltney Shipyard, Chester.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Livingstone & Cooper, Ltd., Hessle, Hull.
MacLaren Bros., Ltd., Dumbarton.
Perman & Co., Ltd., 82-83, Fenchurch St., E.C.
Seamless Steel Boat Co., Ltd., Wakefield.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
Watson, J. S., Gainsborough.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

LAUNDRY MACHINERY—
Bradford, T., & Co., Salford, Manchester.

LAVATORY FITTINGS AND APPLIANCES—
Levick, John, Alma Street, Aston, Birmingham.

LEAD (Sheets and Pipes)—
Rimer Bros., Newcastle-on-Tyne.

LEAD (White and Red)—
Rimer Bros., Newcastle-on-Tyne.

LIFEBELTS AND BUOYS—
Speedings Ltd., Sail Works, Sunderland.

LIFTS (Window)—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.

LIFTS AND HOISTS—
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh
Waygood-Otis, Ltd., Falmouth Road, S.E.

LIGHTERAGE—
Alexander, W. H. J., St. John's Wharf, Wapping, E.

LIGHTERS—
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow.
Crichton, J., & Co., Saltney Shipyard, Chester.
Watson, J. S., Gainsborough.

LIMEWASHING & DISINFECTING MACHINES—
Stonehouse Works Co., Ltd., Houghton Street, West Bromwich.

LOCKS—
Kaye, Joseph, & Sons, Ltd., Leeds.

LOCOMOTIVE TUBES (Copper & Brass)—
Yorkshire Copper Works, Ltd., Leeds.

LUBRICATORS— [Cranstonhill, Glasgow.
McRobbie, John, & Sons, 94, Elliott Street,

MACHINE TOOLS—
Campbells & Hunter, Ld., Dolphin Foundry, Leeds.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Scriven & Co., Leeds Old Foundry, Leeds.

MACHINERY NAME PLATES—
Brown, Robert, & Co., 12, Espedair St., Paisley.

MAGNESIA—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

MARINE ENGINEERS—
Bailey, C. H., Newport, Mon. Barry Docks.
Barry Graving Dock & Engineering Co., Ltd., Barry Docks.
Brown, John, & Co., Ltd., Clydebank, Nr. Glasgow.
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool. [Southampton.
Day, Summers & Co., Ltd., Northam Ironworks,
Diamond, Thos., & Co., Cardiff.
Doxford, Wm., & Sons, Ltd., Sunderland.
Ellis & Jeffery, East Dock, Cardiff.
Gray, Wm., & Co., Ltd., West Hartlepool.
Harland & Wolff, Ltd., Belfast.
Harris Bros., Ltd., Cambrian Dry Docks, Swansea.
Hawthorn, R. & W., Leslie & Co., Ltd., Hebburn-on-Tyne.
Hill's Dry Docks & Engineering Co., Ltd., Cardiff.

MARINE ENGINEERS *(cont'd)*—
Livingstone & Cooper, Ltd., Hessle, Hull.
Mount Stuart Dry Dock Co., Ltd., Cardiff.
Perman & Co., Ltd., 82-83, Fenchurch St., E.C.
Richardson, Westgarth & Co., Ltd., Hartlepool.
Shearman, John, & Co., Ltd., Cardiff.
Smith, Wm., & Co., Ltd., Rosyth, N. Scotland.
St. John, Alex., & Sons, Ltd., Dartford, Kent.
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne. [Westminster, S.W.
Thornycroft, John I., & Co., Ltd., Caxton House,
Wallsend Slipway & Engineering Co., Ltd., Wallsend-on-Tyne.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.
Workman Clark & Co., Ltd., Belfast.
Yarrow & Co., Ltd., Glasgow.

MARINE GOVERNORS—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.

MARKING-OFF TABLES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

MATTRESSES—
Stewart, Archibald, & Co., 40-48, Union St., Glasgow

METALLIC PACKING—
Allen, Cheney & Hole Co., Ltd., Bridlington. Birmingham.
Beldam Packing & Rubber Co., Ltd., 1 and 2, Gracechurch Street, London, E.C.
McConnell, A., & Co., Ltd., 60, Drury Buildings, Water Street, Liverpool.
United States Metallic Packing Co., Ltd., Bradford

METAL SPINNINGS—
Levick, John, Alma Street, Aston, Birmingham.

METALS (Patent)—
Bowran, Robt., & Co., Ltd., Newcastle-on-Tyne.
Delta Metal Co., Ltd., Delta Works, East Greenwich.

MOTOR BOATS—
Crichton, J., & Co., Saltney Shipyard, Chester.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Livingstone & Cooper, Ltd., Hessle, Hull.
MacLaren Bros., Ltd., Dumbarton.
Perman & Co., Ltd., 82-83, Fenchurch St., E.C.
Seamless Steel Boat Co., Ltd., Wakefield.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

MOTOR STARTING AND CONTROL GEAR— [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

NAVAL ARCHITECTS' SUPPLIES—
Walker, Jas., & Co., 11, Bishop Court, Anderston, Glasgow.

OIL CANS—
Kaye, Joseph, & Sons, Ltd., Leeds.

OIL ECONOMISERS—
Kaye, Joseph, & Sons, Ltd., Leeds.

OIL ENGINES—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Edina Manufacturing Co., 19h, Broad Wynd, Leith.
Fair, Walter D., & Co., 43, Leicester Square, London, W.C.
Perman & Co., Ltd., 82-83, Fenchurch Street, E.C.
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, S.W.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

OIL-FUEL INSTALLATION—
Wallsend Slipway & Engineering Co., Ltd., Wallsend-on-Tyne.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

OIL IMPORTERS & BLENDERS—
Rimer Bros., Newcastle-on-Tyne.

PACKING (Engine)—
Beldam Packing & Rubber Co., Ltd., 1 and 2, Gracechurch Street, London, E.C.
Walker, Jas., & Co., Ltd., Lion Works, Garford Street, West India Dock Road, E.

PAINTS—
Briggs, W., & Sons, Ltd., Dundee.
Cocks, Harry, & Co., Cardiff.
Hamilton, Archd., & Co., Possilpark, Glasgow.
Hoyle, Robson, Barnett, & Co., Ltd., St. Nicholas Chambers, Newcastle-on-Tyne.
Wailes Dove Bitumastic Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.
Websters Ltd., Hull.

PANELLING—
Stewart, Archibald, & Co., 40-48, Union St., Glasgow

PATENT HAWSE PIPE AND DECK FLANGE—
Hamilton, A., & Sons, 13, Bute Crescent, Docks, Cardiff.

PERFORATED METALS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Piggott, T., & Co., Ltd., Birmingham.

PIPES—
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.
Yorkshire Copper Works, Ltd., Leeds.

PLANING MACHINES for Plate Edges—
Scriven & Co., Leeds Old Foundry, Leeds.

PLATE BENDING ROLLS—
Scriven & Co., Leeds Old Foundry, Leeds.

PORCELAIN ENAMELLED CAST IRON—
Levick, John, Alma Street, Aston, Birmingham.

PROPELLERS—
Billington & Newton, Ltd., Longport, Staffs.
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool.
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

PROPELLER BLADES—
Darlington Forge Co., Ltd., Darlington.
Stephen & Ltd., 11, Oswald St., Glasgow.

PUBLICATIONS—
Shipping Gazette and Lloyd's List, Queen Anne Chambers, Westminster, London, S.W.

PULLEY BLOCKS—
Higgs, 7, Hurst Street, Liverpool.
Loveridge, Ltd., Cardiff.
Wright, Ltd., Tipton, Staffs.

PUMPS—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Beresford Eng'n'ring Co., Beresford Lane, Cardiff.
Brown, Ltd., Works, Leeds.
Hartlepool.
Davey & Co. (London), Ltd., 88, West India Dock Road, E.
Dawson & Downie, Elgin Works, Clydebank.
Leith.
Hall, Ltd., Portsmouth.
Mather & Platt, Ltd., Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.

PUNCHING AND SHEARING MACHINES—
Scriven & Co., Leeds Old Foundry, Leeds.

RADIATORS—
British Thomson-Houston, Co., Ltd., Rugby.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

RADIATOR TUBES—
Yorkshire Copper Works, Ltd., Leeds.

REAMERS—
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

REFRIGERATING MACHINERY—
Hall, J. & E., Ltd., Dartford Ironworks, Kent.
Liverpool Refrigeration Co., Ltd., Colonial House, Liverpool.
Sterne, L. & Co., Ltd., Crown Ironworks, Glasgow.

RESCUE APPLIANCES—
Mining Engineering Co., Ltd., Meco Works, Moorfields, Sheffield.

REVERSING ENGINES (Direct-Acting Type)— [Works, Edinburgh.
Brown Brothers & Co., Ltd., Rosebank Iron
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh

RHEOSTATS & RESISTANCES (all kinds)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

ROUND AND OVAL HOLE CUTTING-OUT MACHINES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

RUBBER GOODS—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.

RUBBER HOSE—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.

RUSTLESS IRON—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

SAFE MANUFACTURERS—
Whitfield's Safe & Door Co., Oxford Street, Birmingham.

SALOON LIGHTS—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.

SALVAGE—
Alexander, W. H. J., St. John's Wharf, Wapping, E.

SANITARY FITTINGS AND APPLIANCES—
Levick, John, Alma Street, Aston, Birmingham.

SCREWING MACHINES—
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

SHAFTING—
Brown, John, & Co., Ltd., Atlas Works, Sheffield.
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

SHAPING MACHINES—
Greenwood & Batley, Ltd., Albion Works, Leeds.

SHEAVES—
Higginson & Co., 7, Hurst Street, Liverpool.

SHEERS, TRAVERSING (Land and Floating)—
Day, Summers & Co., Ltd., Northam Ironworks, Southampton.

SHIP APPLIANCES—
Linkleter's Patent Ship Fittings Co., 20, Percy Street, Tynemouth.

SHIP BROKERS—
Walford, Leopold (London) Ltd., 29, Gt. St. Helens E.C.

SHIP BROKERS (Sale and Purchase)—
Pinkney, Thos., & Sons, Sunderlan
Walford, Leopold (London) Ltd., 29, Gt St. Helens, E.C.

BUYERS' GUIDE—*continued.*

SHIPBUILDERS—
Brown, John, & Co., Ltd., Clydebank, Nr. Glasgow.
[illegible]
Doxford, Wm., & Sons, Ltd., Sunderland.
Gray, Wm., & Co., Ltd., West Hartlepool.
Hamilton, Wm., & Co., Ltd., Port Glasgow.
[illegible]
Hawthorn, R. & W., Leslie & Co., Ltd., Hebburn-on-Tyne.
Hogg-Carr Construction Co., Ltd., Newcastle-on-Tyne.
Isherwood, J. W., 4, Lloyd's Avenue, London, E.C.
Livingstone & Cooper, Ltd., Hessle, Hull.
Simons, Wm., & Co., Ltd., Renfrew, Nr. Scotland.
Stephen, Alex., & Sons, Ltd., Linthouse, Govan, Glasgow.
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne. [Westminster, S.W.
Thornycroft, John I., & Co., Ltd., Caxton House,
Watson, J. S., Gainsborough.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.
Workman Clark & Co., Ltd., Belfast.
Yarrow & Co., Ltd., Glasgow.

SHIP CONSTRUCTION—
Brown, John, & Co., Ltd., Clydebank, Nr. Glasgow.
Hogg-Carr Construction Co., Ltd., Newcastle-on-Tyne.
Isherwood, J. W., 4, Lloyd's Avenue, London, E.C.
Simons, Wm., & Co., Ltd., Renfrew, Nr. Scotland.
Swan, Hunter, & Wigham Richardson, Ltd., and Maxwell Ballard, Wallsend Shipyard, Wallsend-on-Tyne.

SHIP FURNISHINGS & FITTINGS—
Cocks, Harry, & Co., Cardiff.
Davey & Co. (London), Ltd., 88, West India Dock Road, E.
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield. [Street, North Shields.
Linkleter's Patent Ship Fittings Co., Hudson
Loveridge, Ltd., Cardiff.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow. [Liverpool.
Metallic Valve Co., Colonial House, Water Street,
Stewart, Archibald, & Co., 40-48, Union Street, Glasgow.
Waygood-Otis, Ltd., Falmouth Road, S.E.

SHIP LAVATORIES—
Stewart, Archibald, & Co., 40-48, Union St., Glasgow

SHIP PLATES (Steel)—
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.

SHIP REPAIRERS—
Bailey, C. H., Newport, Mon.
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool. [Southampton.
Day, Summers & Co., Ltd., Northam Ironworks,
Diamond, Thos., & Co., Cardiff.
Doxford, Wm., & Sons, Ltd., Sunderland.
Elliott & Jeffery, East Dock, Cardiff.
Gray, Wm., & Co., Ltd., West Hartlepool.
Grayson, H. & C., Ltd., Royal Liver Building, Liverpool.
Harland & Wolff, Ltd., Belfast.
Harris Bros., Cambrian Dry Docks, Swansea.
Hawthorn, R. & W., Leslie & Co., Ltd., Hebburn-on-Tyne.
Hill's Dry Docks & Engineering Co., Ltd., Cardiff.
Mounstuart Dry Docks, Ltd., Cardiff.
Shearman, John, & Co., Ltd., Cardiff.
Stephen, Alex., & Sons, Ltd., Linthouse, Govan, Glasgow.
Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne.
Wallsend Slipway & Engineering Co., Ltd., Wallsend-on-Tyne.
Yarrow & Co., Ltd., Glasgow.

SHIPS' ELECTRIC FITTINGS—
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

SHIPS' LAUNDRIES—
Bradford, T. & Co., Salford, Manchester.

SHIPS' TELEGRAPHS—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.
Robinson, A., & Co., Ltd., Bootle, Liverpool.

SIGNAL FLASHING AND CABIN LAMPS—
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.

SILICATE-COTTON SPECIALITIES— [Glasgow.
Walker, Jas., & Co., 11, Bishop Court, Anderston,

SKYLIGHT & LIFTING GEARS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.

SLAG WOOL (Silicate Cotton)—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

SLEWING GEAR (for Ships' Derricks)—
Edina Manufacturing Co., 19h, Broad Wynd, Leith.

SMITHS' HEARTHS—
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

SOLDER—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

SPEAKING TUBES—
Dunham, Churchill & Co., Grimesthorpe, Sheffield.

SPELTER—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

SPIRAL SPRINGS—
Cockburns Ltd., Cardonald, Nr. Glasgow.
Sterne, L., & Co., Ltd., Crown Iron Works, Glasgow.

SPONGE—
Phillips, John, & Sons, Ltd., Dingley Road, City Road, London, E.C.

STAMPINGS—
Delta Metal Co., Ltd., East Greenwich.

STAYBOLTS—
Hingley & Sons, Ltd., Netherton Iron Works, Dudley, Staffs.

STEAM-FITTING MANUFACTURERS—
Dixon, S., & Sons, Ltd., Leeds.
Royles Ltd., Irlam, Nr. Manchester.

STEAM-HEATING—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

STEAM KETTLES—
Royles Ltd., Irlam, Nr. Manchester.

STEAM PIPES—
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.
Yorkshire Copper Works, Ltd., Leeds.

STEAM TRAPS—
Cockburns Ltd., Cardonald, Nr. Glasgow.
Royles Ltd., Irlam, Nr. Manchester.

STEAMSHIP SPECIALITIES—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield. [Liverpool.
Metallic Valve Co., Colonial House, Water House,

STEEL—
Brown, John, & Co., Atlas Works, Sheffield.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

STEEL BARGES—
Crichton, J., & Co., Saltney Shipyard, Chester.
Watson, J. S., Gainsborough.

STEEL BOATS—
Crichton, J., & Co., Saltney Shipyard, Chester.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Seamless Steel Boat Co., Ltd., Wakefield.

STEEL MAKERS—
Brown, John, & Co., Atlas Works, Sheffield.
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

STEEL PLATES AND SHEETS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.

STEERING-GEAR—
Brown Brothers & Co., Ltd., Rosebank Iron Works, Edinburgh.
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool.
Hastie, John, & Co., Ltd., Greenock.
Higginson & Co., 7, Hurst Street, Liverpool.

STEERING GEAR (Buffers)—
Loveridge, Ltd., Cardiff.

STEERING TELEMOTORS—
Brown Brothers & Co., Ltd., Rosebank Iron Works, Edinburgh.
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.

STOCKS AND DIES—
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

STORES (Ship)—
Walker, Jas., & Co., 11, Bishop Court, Anderston, Glasgow.

STRONG ROOM MANUFACTURERS—
Whitfield's Safe & Door Co., Oxford St., Birmingham

STRONG ROOM DOOR MANUFACTURERS—
Whitfield's Safe & Door Co., Oxford St., Birmingham

STRUCTURAL ENGINEERS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

SUPERHEATERS—
Central Marine Engine Works, West Hartlepool.
Superheater Corporation, Ltd., Palace Chambers, 9, Bridge Street, Westminster, S.W.

SUSPENSION BULB FURNACE—
Leeds Forge Co., Ltd., Leeds.

SWITCHBOARDS—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Mather & Platt, Ltd., Manchester.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

SWITCHGEAR & INSTRUMENTS—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

SYRENS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

TANK TOP COVERING—
Hamilton, Archd., & Co., Possilpark, Glasgow.
Wailes Dove Bitumastic Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.

TANKS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Mather & Platt, Ltd., Manchester.

TARPAULINS—
Speedings Ltd., Sail Works, Sunderland.

TELEPHONES—
Graham, Alfred, St. Andrew's Works, Crofton Park Road, S.E.
McGeoch, Wm., & Co., Ltd., 28, West Campbell Street, Glasgow.

TIMEPIECES—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.

TOOL STEEL—
Brown, John, & Co., Atlas Works, Sheffield.

TOWAGE—
Alexander, W. H. J., St. John's Wharf, Wapping, E.
Tilbury Contracting & Dredging Co., Ltd., Queen Anne's Chambers, Westminster, London, S.W.

TUBE PLATE CUTTING-OUT MACHINES—
Campbells & Hunter Ltd., Dolphin Foundry, Leeds.

TUBES—
Dixon, S., & Sons, Ltd., Leeds.
Royles Ltd., Irlam, Nr. Manchester.
Staffordshire Tube Co., Ltd., Birmingham.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.
Yorkshire Copper Works, Ltd., Leeds.

TUBES (Brass and Copper)—
Yorkshire Copper Works, Ltd., Leeds.

TUBES & FITTINGS (Wrought Iron)—
Staffordshire Tube Co., Ltd., Birmingham.

TURBINE BLADING—
Aston Chain & Hook Co., Ltd., Erdington, Birmingham.

TURBINE OIL—
Rimer Bros., Newcastle-on-Tyne.

TURBINES (Auxiliary)—
Belliss & Morcom, Ltd., Birmingham.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Mather & Platt, Ltd., Manchester.

TURBINES (Propulsive)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Brown, John, & Co., Ltd., Clydebank, nr. Glasgow.
Gray, Wm., & Co., Ltd., West Hartlepool.
Harland & Wolff, Ltd., Belfast.
Hawthorn, R. & W., Leslie & Co., Ltd., St. Peter's, Newcastle-on-Tyne.
Howden, James, & Co., Ltd., Scotland Street, Glasgow.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.
Thornycroft, J. I., & Co., Ltd., Caxton House, Westminster.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.
Workman, Clark & Co., Ltd., Belfast.
Yarrow & Co., Ltd., Glasgow.

TWIST DRILLS—
Brown, John, & Co., Atlas Works, Sheffield.
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

UPHOLSTERERS—
Stewart, Archibald, & Co., 40-48, Union St., Glasgow

VACUUM CLEANERS—
The British Vacuum Cleaner Co., Ltd., 77, Parsons Green Lane, Fulham, S.W.

VALVES—
Cockburns Ltd., Cardonald, Nr. Glasgow.
Dixon, S., & Sons, Ltd., Leeds.
Mather & Platt, Ltd., Manchester.
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow. [Liverpool.
Metallic Valve Co., Colonial House, Water Street,
Royles Ltd., Irlam, Nr. Manchester.

VALVE RE-SEATER—
Brooke, G., Lloyds Bank Chambers, Docks, Cardiff.
Greenwood & Batley, Ltd., Albion Works, Leeds.

VENTILATORS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Grieve, T., & Sons, Bedford Street, North Shields.
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.
Loveridge, Ltd., Cardiff.
Low, Archibald, & Sons, Ltd., 78, Merkland St., Partick, Glasgow.

WAR MATERIAL—
Brown, John, & Co., Atlas Works, Sheffield.

WELDING & CUTTING—
Carbic Ltd., 51, Holborn Viaduct, London, E.C.

WINCHES—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool.
Fair, Walter D., & Co., 43, Leicester Square, London, W.C.
Higginson & Co., 7, Hurst Street, Liverpool.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

WINDLASSES—
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool.
Edina Manufacturing Co., 19h, Broad Wynd, Leith.

WIRE-ROPE COMPRESSORS—
Edina Manufacturing Co., 19h, Broad Wynd, Leith.

WOOD-WORKING MACHINERY—
Adam, J. M., & Co., Greenfield Iron Works, Dalmarnock, Glasgow.
Stonehouse Works Co., Ltd., Houghton Street, West Bromwich.
Wadkin & Co., North Evington, Leicester.

WORK TABLES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds

YACHT BUILDERS—
Crichton, J., & Co., Saltney Shipyard, Chester.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.
Yarrow & Co., Ltd., Glasgow.

ZINC—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

P & O and British India
Mail & Passenger Services

Frequent and Regular Sailings from LONDON, MARSEILLES, &c.
Tickets Interchangeable.

MEDITERRANEAN, EGYPT, INDIA, BURMA, STRAITS, CHINA, JAPAN, AUSTRALASIA, MAURITIUS, EAST and SOUTH AFRICA.

Australian Tickets of P & O and Orient Lines are also interchangeable.

For particulars of PENINSULAR AND ORIENTAL SAILINGS apply at the P. & O. Offices, 122, Leadenhall Street, E.C., or Northumberland Avenue, W.C., London.
For particulars of BRITISH INDIA SAILINGS apply GRAY, DAWES & Co., 23, Gt. Winchester St., E.C.; P. & O. West-end Office, 17, Northumberland Avenue, W.C.; or GELLATLEY, HANKEY & Co., Dock House, Billiter Street, E.C.

P & O Round - the - World Tours.
Handbook on Application.

R.M.S.P. & P.S.N.C.

TO THE PENINSULA,
MADEIRA, CANARY IS.

BRAZIL, RIVER PLATE.

CHILE, PERU, ECUADOR,
WEST INDIES,
BRITISH & DUTCH GUIANA, COLOMBIA, COLON,
AND THROUGH
PANAMA CANAL
TO PACIFIC PORTS.
MOROCCO.

For particulars apply—
THE ROYAL MAIL STEAM PACKET COMPANY.
THE PACIFIC STEAM NAVIGATION COMPANY.
LONDON—18, Moorgate Street, E.C. and 32, Cockspur Street, S.W.
LIVERPOOL—31, James Street.

THE NEW ZEALAND SHIPPING COMPANY
(Incorporated in New Zealand.) LIMITED.

Direct Service of Swift Royal Mail Steamers.

ROUTE:

Outwards ... London, Teneriffe, Cape Town, Hobart, New Zealand.
Homewards ... New Zealand, Montevideo and/or Rio de Janeiro, Teneriffe, Plymouth, London.

These Steamers are particularly adapted for the New Zealand trade, are of the highest class, lighted throughout with electric light, and are fitted with every modern improvement for the safety, comfort, and convenience of passengers. The Mail Steamers are fitted with the Marconi System of Wireless Telegraphy. Steamers are dispatched every fourth Thursday from London and from New Zealand. Passengers booked to Teneriffe and Cape Town, and to Australia and Tasmanian ports *via* Hobart.

HEAD OFFICES—138, Leadenhall Street, London, E.C.
AND CHRISTCHURCH, NEW ZEALAND.

For Freight and Passage apply to—
J. B. WESTRAY & Co., 138, Leadenhall Street, London, E.C.

GLEN AND SHIRE JOINT SERVICE OF STEAMERS

FROM
Antwerp, Middlesbrough, Hull, London,
DIRECT TO
Penang, Singapore, Hong Kong, Shanghai, Kobe, Yokohama and North Pacific Ports.

TAKING CARGO AT THROUGH RATES TO ALL THE PRINCIPAL DESTINATIONS IN THE FAR EAST.

For freight apply to the Brokers:—
McGREGOR, GOW, NORRIS & JOYNER, Ltd.,
4, FENCHURCH AVENUE, E.C.
Tel. No. Avenue 4478. Telegraphic Address: "Eastwardly, London."

"SHIRE" LINE STEAMERS.
Owners:
THE ROYAL MAIL STEAM PACKET CO.,
18, Moorgate Street, E.C.
Tel. No 3720 Wall.
4, Fenchurch Avenue, London, E.C.
Telegraphic Address:—
"Omarishire, London."
Tel. No. 3568 Avenue.

"GLEN" LINE STEAMERS.
For passage apply to the Owners:
GLEN LINE (McGREGOR, GOW, & CO.),
— LTD., —
1, East India Avenue, London, E.C.
Telegraphic Address:—
"Macgregor, London."
Tel. No. 458 Avenue.

WEST AND SOUTH-WEST COASTS OF AFRICA, AND THE CANARY ISLANDS.

The Royal Mail Steamers of the
AFRICAN STEAM SHIP CO.
(Incorporated 1852 by Royal Charter) and
THE BRITISH AND AFRICAN STEAM NAVIGATION CO., LTD.,

MAINTAIN REGULAR SAILINGS.
Taking Passengers at Low Rates.

Elder Dempster and Co., Limited,
Head Office—Colonial House, LIVERPOOL.
And at London, E.C., Manchester, Cardiff, Birmingham, Hull, &c.

LAMPORT & HOLT LINE

TO AND FROM
SOUTH AMERICA.

Mail and Passenger Steamers, fortnightly between NEW YORK, BRAZIL and ARGENTINE, calling also WEST INDIES (Trinidad and Barbados).

First Class Fast Cargo Steamers (carrying passengers), regular and frequent Sailings from MIDDLESBRO' and LONDON, MANCHESTER, GLASGOW and LIVERPOOL to BAHIA, RIO DE JANEIRO and SANTOS; to MONTE VIDEO and BUENOS AYRES.
From LIVERPOOL and HAVRE, to WEST COAST OF SOUTH AMERICA.
Between NEW YORK and MANCHESTER.

For descriptive Booklets and all particulars, apply to:—
LAMPORT & HOLT, LIMITED, ROYAL LIVER BUILDINGS, LIVERPOOL.
Telegrams:—"Lamport."

C. H. BAILEY.

Tyne Engine and Ship Repairing Works,
SHIP REPAIRERS & ENGINEERS.
Up-to-Date Plant for Quick and Efficient Repairs.

Oxy-Acetylene and Electric Welding a speciality. Portable and fixed Electric Plant for all purposes.
LIFEBOATS and ICE CHESTS Made and Delivered at Short Notice. Efficiency, Economy and Despatch.

Dry Dock Accommodation: Can Dry dock Four Large Steamers at Barry and Two at Newport at the same time. **Barry Dock Commercial Dry Dock:** Length **867** ft., Width at Top **113** ft. **6** in., at Bottom **100** ft., at Entrance **60** ft.

NEWPORT (MON.) AND BARRY DOCK.
Telegrams: "**Bailey, Barry.**" "**Bailey, Newport.**"
Telephones:—Barry Works: Nat. **36**: G.P.O. **9.**
Newport Works: Nat. **3.** G.P.O. **3.**

SLIPWAY PROPRIETORS, ENGINEERS, BOILERMAKERS, &c.

WINDSOR SLIPWAYS:—
CARDIFF ENTRANCE CHANNEL.
Two Slipways take Vessels 341 ft. × 50 ft.
Gridiron with Jetty 450 ft. suitable for Vessels lying alongside for survey and other repairs.

All vessels using slipways are free of Harbour and Wet Dock Dues, and can proceed to any loading Port

ELLIOT & JEFFERY

MAIN WORKS:—
Corner of EAST DOCK.

BRANCH WORKS:—
Commercial Dry Dock *(600 ft. × 60 ft.)*, **Roath Basin.**

CARDIFF.

Telegraphic Address:—"Eclipse, Cardiff."
Telephones:—Main Works 2826 (2 lines). Branch Works 2204.
Windsor Slipways 772. Mr. J. Elliot 3571. Mr. T. Elliot 3456.

ALPHABETICAL INDEX TO ADVERTISERS.

A

Aberdeen Line ... ... —
Adam, J. M., & Co. ... ... —
Alexander, W. H. J. 1
Allen, W. H., Son & Co., Ltd. ... —
Aspinall's Patent Governor Co., Ltd. —
Aston Chain & Hook Co., Ltd. ... —
Atlas Preservative Co., Ltd. 4

B

Bailey, C. H. 21
Barry Graving Dock & Eng. Co., Ltd. 16
Beldam Packing & Rubber Co., Ltd. —
Belliss & Morcom, Ltd. ... ... —
Beresford Engineering Co. 22
Berry, Henry, & Co., Ltd. ... ... —
Beynon, T., & Co., Ltd. ... ... —
Boothroyd, H. T., Ltd., ... —
Bowran, Robt., & Co., Ltd. 1
Braby, Fredk., & Co., Ltd. ... ... —
Bradford, T., & Co. 12
Briggs, W., & Sons, Ltd. ... ... —
Britannic Merthyr Coal Co., Ltd. ... 9
British Thomson-Houston Co., Ltd. —
British Westinghouse Electric and Manufacturing Co., Ltd. ... ... —
Brooke, G. ... ... —
Brown Bros., & Co. 16
Brown, David, & Sons, Ltd. ... ... —
Brown, John, & Co., Ltd. ... ... —
Brown, Robert, & Co., Ltd. ... ... —
Buyers' Guide ... ... 17, 18, 19 & 20
Byers, W. L., & Co., Ltd. ... ... —

C

Cambrian Collieries, Ltd. 9
Campbells & Hunter, Ltd. 5
Carbic, Ltd. 14
Central Marine Engine Works ... —
Chadburns Telegraph Co., Ltd. ... —
Chalmers, Wm., & Co., Ltd. 23
Chatwin, Thos., Ltd. 7
Cockburns, Ltd. 15
Cocks, Harry, & Co. ... ... —
Crichton, C. & H., Ltd. ... ... —
Crichton, J., & Co., Ltd. 6

D

Darlington Forge Co., Ltd. ... ... —
Davey & Co. (London), Ltd. ... ... —
Davidson & Co., Ltd. ... ... —
Davis, D., & Sons, Ltd. 8
Dawson & Downie 16
Day, Summers & Co., Ltd. 6
Deighton's Patent Tube & Flue Co., Ltd. 9
Delta Metal Co., Ltd. 1
Diamond, T., & Co. 16
Docker Bros., Ltd. 2
Doxford & Sons, Ltd. ... ... —
Durham, Churchill & Co. ... ... —

E

Edina Manufacturing Co. ... ... —
Elder, Dempster & Co., Ltd. 21
Elliot & Jeffery 21
Else, John, & Son, Ltd. 16

F

Fair, W. D., & Co., Ltd. 10

G

Glamorgan Coal Co., Ltd. 9
Glen Line, Ltd. 21
Graham, Alfred, & Co. 3
Gray, Wm., & Co., Ltd. ... ... —
Grayson, H. & C., Ltd. 22
Greenwood & Batley, Ltd. ... ... —
Grieve, Thos., & Sons ... ... —

H

Hall, J. & E., Ltd. 15
Hall, J. P., & Sons, Ltd. ... ... —
Hamilton, Archibald H., & Co. ... —
Hamilton, A., & Sons 12
Hamilton, Wm., & Co., Ltd. ... ... —
Harland & Wolff, Ltd. ... ... —
Harris Bros., Ltd. ... ... —
Harrisons (London), Ltd. ... ... —
Hastie, John, Ltd. 5
Hawthorn, R. &W., Leslie & Co., Ltd. —
Heinke, C. E., & Co. ... ... —
Higginson, T., & Co. 24
Hill's Dry Docks 22
Hingley, N., & Sons 1
Hingley & Lamb ... ... —
Hogan & Wardrop 10
Hogg-Carr Construction Co., Ltd. ... —
Holmes, J. H., & Co. 11
Holzapfels, Ltd. 15
Hoyle, Robson & Barnett, Ltd. ... —
Howden, J., & Co., Ltd. 8
Hudson, John, & Co.'s Successors ... —

I

Imperial Merchant Service Guild ... 16
Isherwood, J. W. 14

J

Jones, Fredk., & Co., Ltd. 24

K

Kaye, Joseph, & Sons, Ltd. ... ... —
Keith Blackman Co., Ltd., James ... .
Kelvin, Bottomley & Baird 7

L

Lamport & Holt, Ltd. 21
Laycock, W. S., Ltd. ... ... —
Leeds Forge Co., Ltd. 13
Leitch, J., & Co. ... ... —
Levick, John ... ...
Linkleter's Patent Ship Fittings Co. ... .
Liverpool Patents Co., Ltd. 16
Liverpool Refrigeration Co., Ltd. ... 13
Livingstone & Cooper, Ltd. ... ...
Loveridge, Ltd. 12
Low, Archibald, & Sons, Ltd. ... —

M

MacLaren Bros., Ltd. ... ... —
Mactaggart, Scott & Co., Ltd. ... 4
Martin, W. C., & Co. 1
Mather & Platt, Ltd. ... ... —
McConwell, A., & Co., Ltd. ... ... —
McGeoch, Wm., & Co., Ltd. 1
McRobie, John, & Sons ... .
Mercantile Marine Service Association
Metallic Valve Co. ... ... —
Metograph Co. ... ... —
Milburn, A., & Co. ... ... —
Mining Engineering Co., Ltd. ...
Mountstuart Dry Docks, Ltd. ... —

N

Naval Colliery Co. (1897), Ltd. ... 9
New Zealand Shipping Co., Ltd. ... 21
Nippon Yusen Kaisha ... ... —
North Eastern Railway Docks ... 14

P

P. & O. Steam Navigation Co. ... 21
Perman & Co., Ltd. 13
Phillips, John, & Sons, Ltd. 13
Piggott, Thos., & Co., Ltd. 10
Powell Duffryn Steam Coal Co., Ltd. —

R

Ransomes & Rapier, Ltd. 11
Rennie & Co. ... ... —
Reyrolle, A., & Co., Ltd. ... ... —
Rhymney Iron Co., Ltd. 8
Richardsons, Westgarth & Co., Ltd.
Riley, Edward, & Co. ... ... —
Rimer Bros. ... ...
Robinson, A., & Co. 16
Royal Mail Steam Packet Co., Ltd. ... 21
Royal Merchant Seamen's Orphanage —
Royles, Ltd. 23

S

Saunders & Taylor, Ltd. ... ... —
Scriven & Co. ... ... —
Seamless Steel Boat Co., Ltd. ... —
Shearman, John, & Co., Ltd. ... 16
Simons, Wm., & Co., Ltd. ... ... —
Speedings Ltd. ... ... —
Spencer, John, & Sons, Ltd ... ... —
Spencer & Co., Ltd. ... ...
Staffordshire Tube Co., Ltd. 12
Standard Piston Ring & Eng. Co., Ltd. 16
Stephen, Alex., & Sons, Ltd. ... —
Sterne, L., & Co., Ltd. 23
Stewart & Lloyd's, Ltd. ... ... —
Stewart, Arch., & Co. ... ... —
Stone, J. & Co., Ltd. 1
Stonehouse Works Co., Ltd. ... ... —
Stothert & Pitt, Ltd. ... ... —
Sunderland Forge & Eng. Co., Ltd. ... —
Superheater Corporation, Ltd. 2
Swain, J., & Son, Ltd. 10
Swan, Hunter & Wigham Richardson, Ltd. ... ... —
Swan, Hunter & Wigham Richardson, Ltd., and Maxwell Ballard ... 14
Sykes, R., & Sons, Ltd. ... ... —

T

Taylor, Samuel, & Sons ... ... —
Thornycroft, John I., & Co., Ltd. ... 1
Tilbury Contracting & Dredging Co., Ltd. ... ... —
Trewent, F. J., & Proctor, Ltd. ... 1

U

Union-Castle Line ... ... —
United States Metallic Packing Co. ... 8

W

Wadkin & Co. ... ... —
Walford, Leopold (London), Ltd. ... —
Walker, James, & Co., Ltd. ... ... —
Walker, James (Glasgow) ... ... —
Wailes Dove Bitumastic Ltd. ... —
Wallsend Slipway & Eng'g. Co., Ltd. —
Watson, J. S. 6
Waygood-Otis, Ltd. 9
Websters Ltd. 16
Weir, G. & J., Ltd. ... ... —
White, J. Samuel, & Co., Ltd. ... 6
Whitfield's Safe and Door Co. ... 11
Williams, Wm. ... ... —
Workman, Clark & Co., Ltd. ... ... —
Wright, Joseph, & Co., Ltd. 3

Y

Yarrow & Co., Ltd. ... ... —
Yorkshire Copper Works, Ltd. ... 1

** Where no number is shewn against an Advertiser's name, the advertisement appears either in previous or subsequent issues.*
Classified Index to Advertisers will be found on pages 17, 18, 19 and 20.

SHIP-REPAIRERS
· ENGINEERS ·

Royal Liver Building,
LIVERPOOL.

Telegraphic Address:
"REGULATOR,
LIVERPOOL."

Telephone No.:
8800 Bank.

H. & C. GRAYSON, LTD.

Works:
LIVERPOOL:
North End—
Canada Dock.
South End—
Queen's Dock.
GARSTON:
Grayson's Dry Dock.
BIRKENHEAD:
Graving Dock Works and
Grayson's Slipways.

REPAIRS ON THE MERSEY
PNEUMATIC TOOLS, OXY-ACETYLENE
AND ELECTRIC WELDING PLANT,
PRIVATE DRY DOCK AND SLIPWAYS

HILLS' DRY DOCKS and ENGINEERING CO., LD., CARDIFF.

PNEUMATIC CHIPPING & cleaning a speciality.

Dry Dock Owners (3 Docks), Engineers, Ship Repairers and Ironfounders.

UP-TO-DATE WORKS AND DOCKS.
OXY-ACETYLENE AND ELECTRIC WELDING.
PNEUMATIC TOOLS OF ALL KINDS.

Offices & Works at EAST BUTE DOCK.
Telegrams: "Euclid, Cardiff." Telephone No. 2844.

— THE —
RAPID CIRCULATOR
PATENTED.
ALL STEAM BOILERS
should have them fitted.

It automatically keeps the water circulating, giving a uniform temperature throu out the Boiler, doing away with rac strains which cause leaky seams, gre plates, etc., through unequal expansion.

Easier Steam, Saves Coal.

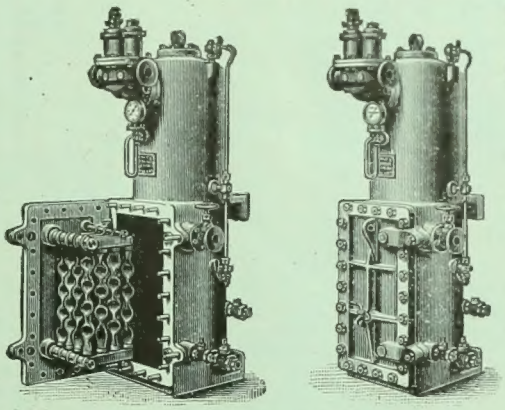
MAKERS
THE BERESFORD ENG. CO.,
Beresford Lane, CARDIFF.

ALSO MAKERS OF FEED HEATERS, SUCTION FILTERS, STERN TUBE GREASE PUMPS, RUDDER BUFFERS, FAIRLEADS, AUXILIARY CONDENSERS, PUMPS, ETC.

ROW'S PATENT EVAPORATORS

FRESH WATER CONDENSERS. FEED WATER HEATERS.

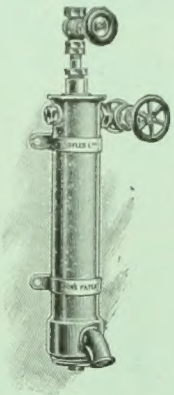
HIGHER DUTY, LESS WEIGHT,
MORE COMPACT,
THAN ANY OTHER SYSTEM.



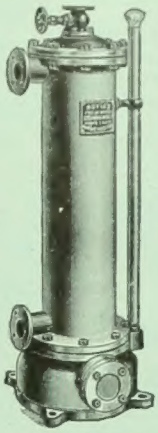
THE "ROW" EVAPORATOR.
Shown open for Cleaning. Closed.

Row's Patent Tube, shown in the margin, which is the leading feature of these Specialities, is **Twice as Efficient** as plain round tube service, and the advantage accruing is obvious. The Tube has a remarkable property of casting scale.

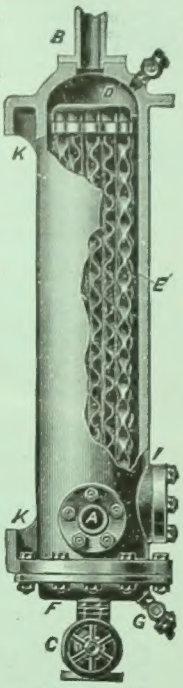
Full Descriptive Lists sent on application.



Instantaneous Water Heater for Ships' Baths & Lavatories.



FRESH WATER CONDENSER.



LIVE STEAM HEATER.

ROYLES LIMITED, ENGINEERS AND SPECIALISTS,
Dalham Works, IRLAM, near MANCHESTER.

Telegrams—ELYOR, CADISHEAD. Telephone—No. 6718 MANCHESTER.

REFRIGERATING MACHINES

CO_2 and Ammonia Systems.

L. STERNE & CO., LTD.,

The Crown Iron Works, GLASGOW.

London Office: DONINGTON HOUSE, NORFOLK STREET, W.C.

WM. CHALMERS & Co., Ltd.

RUTHERGLEN, Nr. GLASGOW.

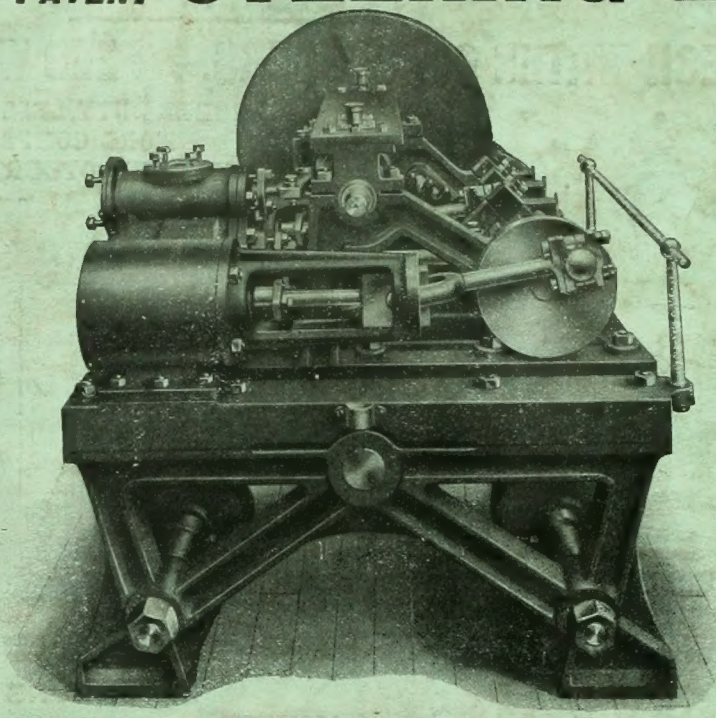
Telegrams: "SCOW, RUTHERGLEN." Cables: "SCOW, RUTHERGLEN."
Telephone: 459 RUTHERGLEN. Code: A B C 5TH EDITION.

Light Draught Shipbuilders & Engineers.

BARGES
YACHTS
LAUNCHES
TUGS
STERN WHEELERS
DOCK GATES
SIDE WHEEL STEAMERS
FLOATING CRANE PONTOONS
FLOATING DOCK PONTOONS
HOPPER BARGES
(SIDE OR BOTTOM DISCHARGING)
SAND PUMP DREDGERS

THE "MOSS" PATENT STEERING ENGINE

THE CYLINDERS ARE FIXED AND THE ORDINARY SLIDE VALVES, ECCENTRICS, AND RODS ARE DISPENSED WITH.



HAVING FEWER WORKING PARTS THE COST OF UPKEEP IS CONSIDERABLY LESS THAN ANY OTHER STEERING GEAR.

Sole Makers: HIGGINSON & CO., Engineers, Hurst Street, Liverpool.

Specify or use

FIREPROOF thermal INSULATION

SLAG WOOL

Indestructible, Vermin-Proof.

THE BEST NON-CONDUCTOR

VIDE NUMEROUS TESTS BY EMINENT & INDEPENDENT AUTHORITIES

FREDK. JONES & Co LTD

9 PERREN ST KENTISH TOWN N.W.

London: Printed by HARRISON & SONS, Printers in Ordinary to His Majesty, 45, 46 and 47, St. Martin's Lane, London, W.C., and published by the Proprietors of SHIPBUILDING AND SHIPPING RECORD, at Queen Anne's Chambers, Broadway, Westminster, London, S.W. *December* 30, 1915.